

**US Army Corps
of Engineers**

New Orleans District

COEMVN-PD-97/03

**CULTURAL RESOURCES SURVEY OF THE
WESTWEGO TO HARVEY CANAL HURRICANE
PROTECTION PROJECT, LAKE CATAOUATCHE
AREA, JEFFERSON PARISH, LOUISIANA**

Final Report

November 1997

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DTIC QUALITY INSPECTED 4

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REPORT DOCUMENTATION PAGE

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1. AGENCY USE (Leave blank)		2. REPORT DATE November 1997		3. REPORT TYPE AND DATES COVERED Final, from 1997 to 1997	
4. TITLE AND SUBTITLE Cultural Resources Survey of the Westwego to Harvey Canal Hurricane Protection Project, Lake Cataouatche Area, Jefferson Parish, Louisiana.				5. FUNDING NUMBERS DACW29-97-M-0295	
6. AUTHOR(S) Kenneth Jones, Rhonda Smith, and Benjamin Maygarden					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Earth Search, Inc. P.O. Box 850319 New Orleans, LA 70185-0319				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Corps of Engineers New Orleans District P.O. Box 60267 New Orleans, LA 70160-0267				10. SPONSORING/MONITORING ORGANIZATION REPORT NUMBER CEMVN-PD-97/03	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Unclassified. Distribution is unlimited.				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) This report presents the results of cultural resources survey undertaken in the linear borrow right-of-way adjacent to the north bank of the Inner Cataouatche Canal, a floodwall borrow area south of Bayou Segnette State Park, and a Reforestation Mitigation Site west of the state park. A total of approximately 183 acres were surveyed. Survey consisted of 20 m transects with shovel tests at 50 m intervals. No cultural resources were recorded within the project areas. An historic equipment complex, termed the Reforestation Tract site (16JE26), was recorded outside the survey area. The site is a dredge boat located in the canal which forms the southern boundary of the Reforestation Mitigation Site. Investigations at 16JE26 were limited to photographic documentation and mapping. 16JE26 is potentially eligible for nomination to the National Register of Historic Places, pending further investigations. 16JE26 will not be impacted by activities in the Reforestation Mitigation Site. No further work is recommended at this time. If future plans will impact 16JE26, further investigations are required to establish its integrity and significance.					
14. SUBJECT TERMS 16JE26, archeology, canals, dredge boat, intensive cultural resources survey, Jefferson Parish, land reclamation				15. NUMBER OF PAGES 118	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL		



DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267
September 25, 1997

REPLY TO
ATTENTION OF:

Planning Division
Environmental Analysis Branch

To the Reader:

This report of survey and site inventory efforts were designed, funded, and guided by the U.S. Army Corps of Engineers, New Orleans District, as part of our cultural resources management program. The report was completed as part of the Westwego to Harvey Canal Hurricane Protection, Lake Cataouatche Area Post-Authorization Change project. We concur with the recommendations and commend the efforts of the authors. Louisiana's State Historic Preservation Officer has reviewed and concurred with the recommendations by letter dated May 29, 1997.


James M. Wojtala
Project Archeologist

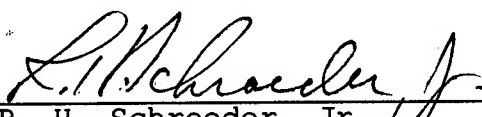

R. H. Schroeder, Jr.
Chief, Planning Division

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CHAPTER 1

INTRODUCTION

This report presents results of the cultural resources survey of the Westwego to Harvey Canal Hurricane Protection Project, Lake Cataouatche Area, Jefferson Parish, Louisiana. The work was performed by Earth Search, Inc. (ESI), under contract with the U.S. Army Corps of Engineers, New Orleans District (NODCOE), Contract No. DACW29-97-Q-0024. The Scope of Services is presented in Appendix 1.

The study area is located on the west bank of the Mississippi River. Project boundaries are generally Bayou Segnette to the east, the Jefferson/St. Charles Parish line to the west, the Mississippi River to the north, and Lake Cataouatche. As per the Scope of Services, cultural resources investigations were undertaken only in those portions of the study area to be impacted by shifting the Inner Cataouatche Canal (interior drainage canal) north as part of the construction of an interior stability berm, a floodwall borrow area, and a reforestation mitigation area (Figure 1).

Fieldwork for this project included two tasks: intensive pedestrian survey of impacted areas and site definition. Fieldwork began February 13, 1997, and extended through February 27, for a total of 28 person days. Approximately 10.7 km (6.6 mi) of levee corridor were surveyed from Levee Stations 156+00 to 506+30.74. A 15 acre floodwall borrow area west of Bayou Segnette State Park was also surveyed. The final parcel surveyed was a 39 acre reforestation mitigation area also west of Bayou Segnette State Park. One new site, 16JE26, was recorded during survey. 16JE26, also named the Reforestation Tract site, consists of the remains of a dredge boat including a wooden platform, metal pulleys, chain and an iron fire box. This site is associated with historic marsh reclamation and should be considered potentially eligible for nomination to the National Register of Historic Places. The site is located adjacent to but immediately outside of the project area. Therefore, it will not be impacted as a result of this undertaking. No further work is recommended at 16JE26 at the present time.

Report Organization

Chapters 2 through 4 present background information on the natural setting, prehistory, and history of the project area. Chapter 5 summarizes the results of field investigations previously conducted within the vicinity of the project area. Chapter 6 describes the field methodology and presents a comprehensive review of the results of field investigations. Recommendations are presented in Chapter 7.

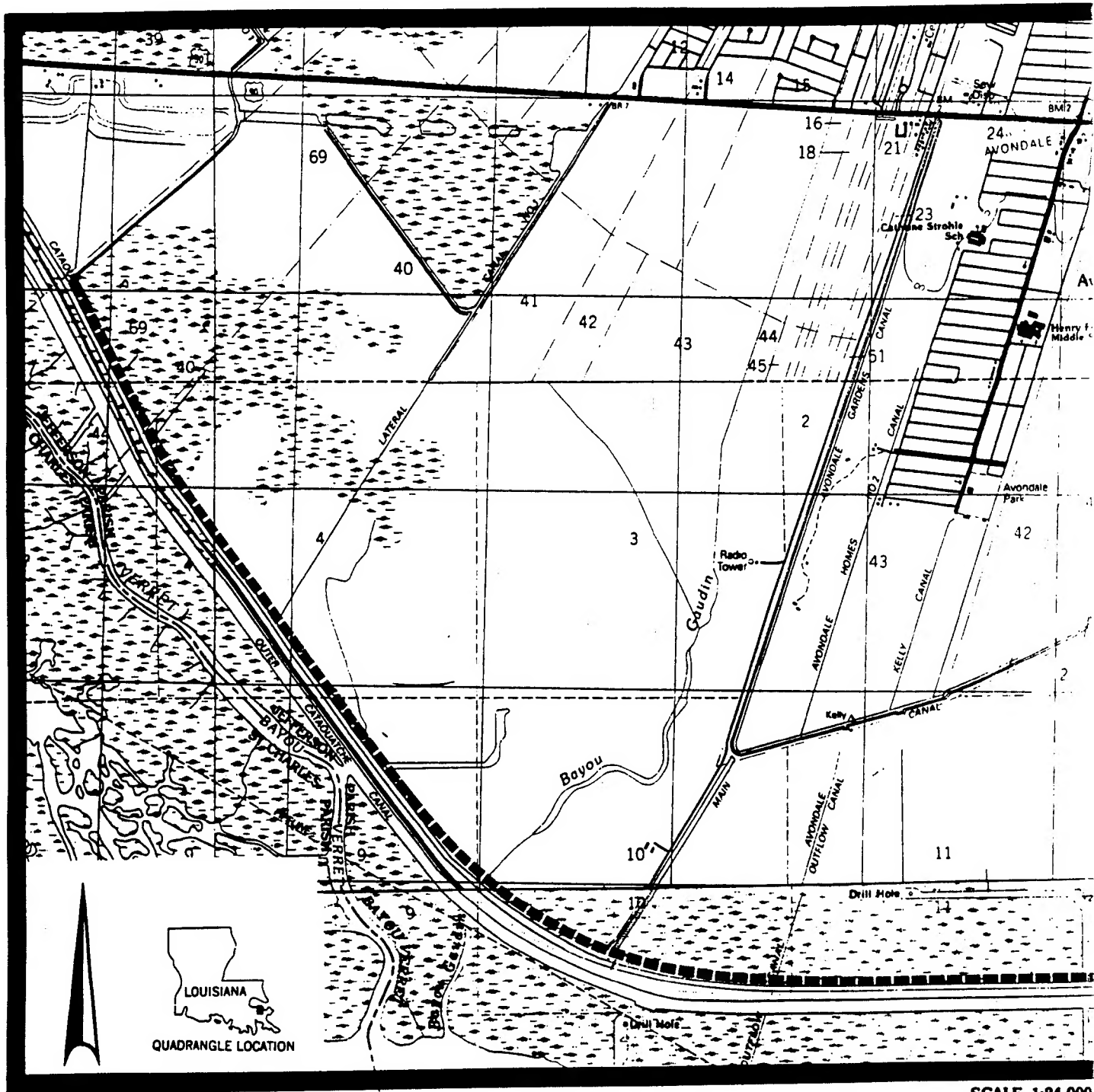
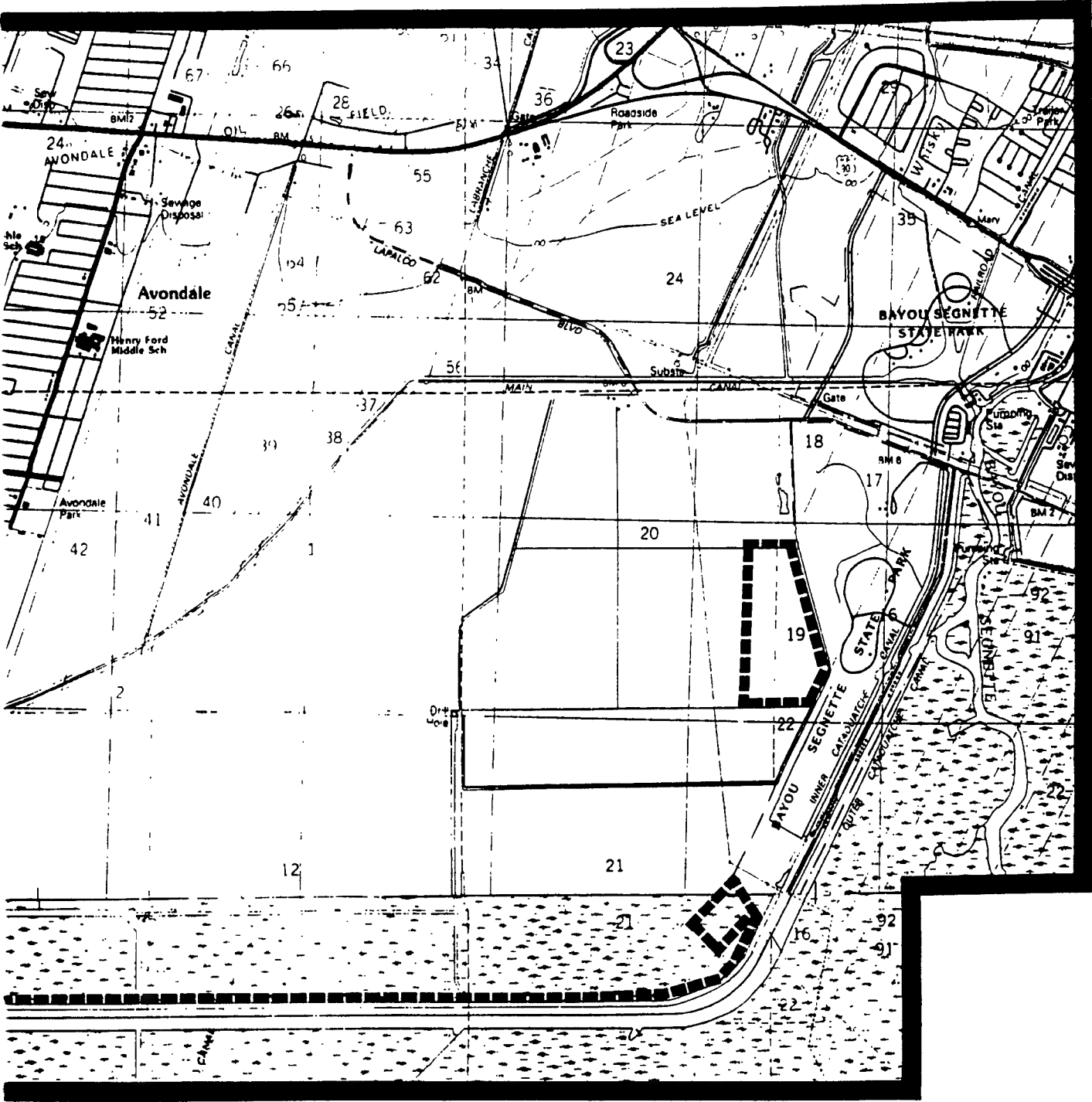
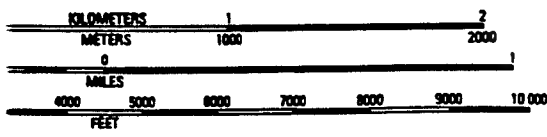


Figure 1. Excerpts from the *Luling, Lake Catao* quadrangles showing project area.



SCALE 1:24 000



g, Lake Cataouache East, and New Orleans West

2

CHAPTER 2 ENVIRONMENTAL SETTING

Physiographic and Biological Setting

The project area is located north of Lake Cataouatche in the northeastern portion of the Barataria Basin. The basin is flanked on the west by the abandoned lobe of the Lafourche Delta and on the east by the abandoned lobe of the Modern Mississippi River delta. The north limit is in the Lac des Allemands swamps, in the vicinity of Donaldsonville, and the south limit is Grand Terre Island (Adams et al. 1976:3). The basin itself encompasses approximately 400,000 ha and is approximately 129 km (80.16 mi) long. Lake Cataouatche is one of several large, shallow lakes situated within the basin. These lakes are interconnected by bayous and surrounded by marshland. The marshland itself is bordered by higher ground that is the result of alluvial deposition from formerly active Mississippi River distributaries (White et al. 1983:101-102).

The Barataria Basin is a broad, low-lying region that represents an abandoned Mississippi River delta complex and the adjacent estuarine and offshore waters associated with that complex. It is characterized by a set of ecological parameters which are integrated into a dynamic ecosystem with enormous biological productivity. The prime integrating feature of this ecosystem is water. Primary units of the system are forests, fresh water marshes, brackish marshes, saline marshes and the offshore area. The Basin lies within an area that is, at present, subsiding and eroding (Bahr and Hebrard 1976:1-3).

Geomorphology

The Mississippi River deltaic plain is the composite result of previous and present progradations of the river. Development of the deltaic plain was initiated over 12,000 years ago when the sea was approximately 60 m (196.85') below its present level (Autin et al. 1991). The deltaic plain formed as a result of the Mississippi River shifting its centers of deposition to accommodate the heavy sediment load with a more efficient route to the sea. This has resulted in the formation of four major abandoned delta complexes: the Maringouin, the Teche, the St. Bernard, and the Lafourche. In addition, there is the actively prograding delta, the Plaquemine-Balize, or modern "birds-foot" delta (Figure 2) (Fisk 1944; Frazier 1967; Saucier 1994).

Approximately 4,800 years ago, the main shoreline of southeastern Louisiana was located north of Lake Pontchartrain, and the active delta was in central coastal Louisiana. At that time, this meander belt along the western side of the Mississippi alluvial valley was abandoned in favor of one along the eastern side. This extended delta lobes past Baton Rouge into the New Orleans area and created broad intratidal marshes and swamps into what formerly had been shallow Gulf waters (Saucier 1994).

The formation of delta lobes involves a cyclic sequence of sedimentary processes which have been replicated to form the delta lobe complexes comprising the present deltaic plain of the alluvial valley (Russell 1936; Fisk 1944; Scruton 1960; Coleman and Gagliano 1964; Frazier 1967). Frazier (1967) describes the development of a delta complex in four stages (Figure 3). Progradation of the delta lobe (Stage 2A) is initiated when the Mississippi discharges its sediment load into the shallow Gulf of Mexico basin. Sorting of sediment is responsible for the buildup of three distinctive vertical sedimentary facies. A broad unstable base of prodelta clays is overlain by a distal bar of silts and clays. Following this is the prograding distributary-mouth bar comprised of coarser sands and silts deposited at the mouth of the stream. The weight of the distributary-mouth bar causes the unstable fine-grained prodelta deposits to compress and subside. Continued aggradation of the distributary-mouth bar causes

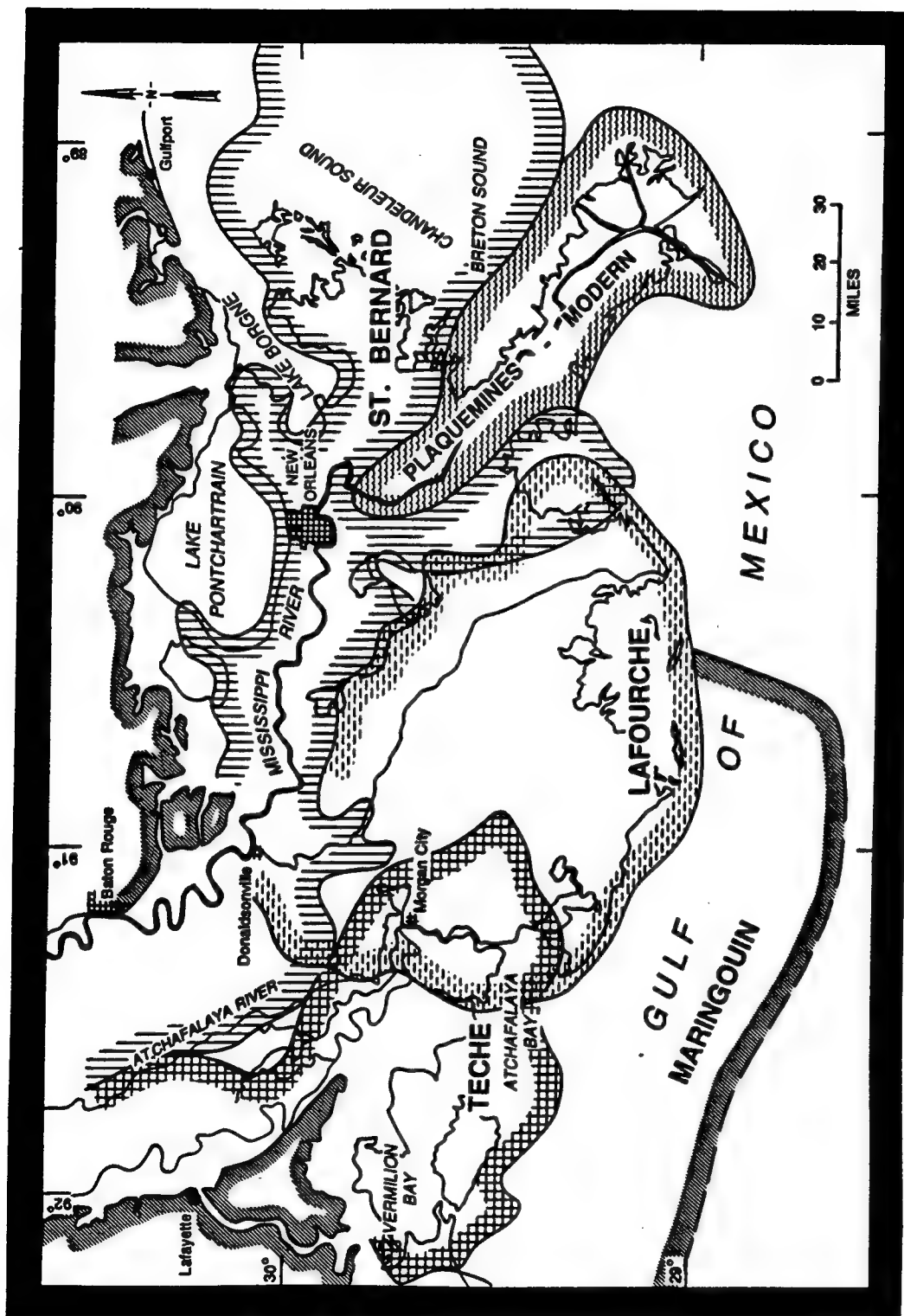


Figure 2. Currently accepted interpretation of the Holocene delta complexes in southern Louisiana (from Saucier 1994:141, Figure 31B).

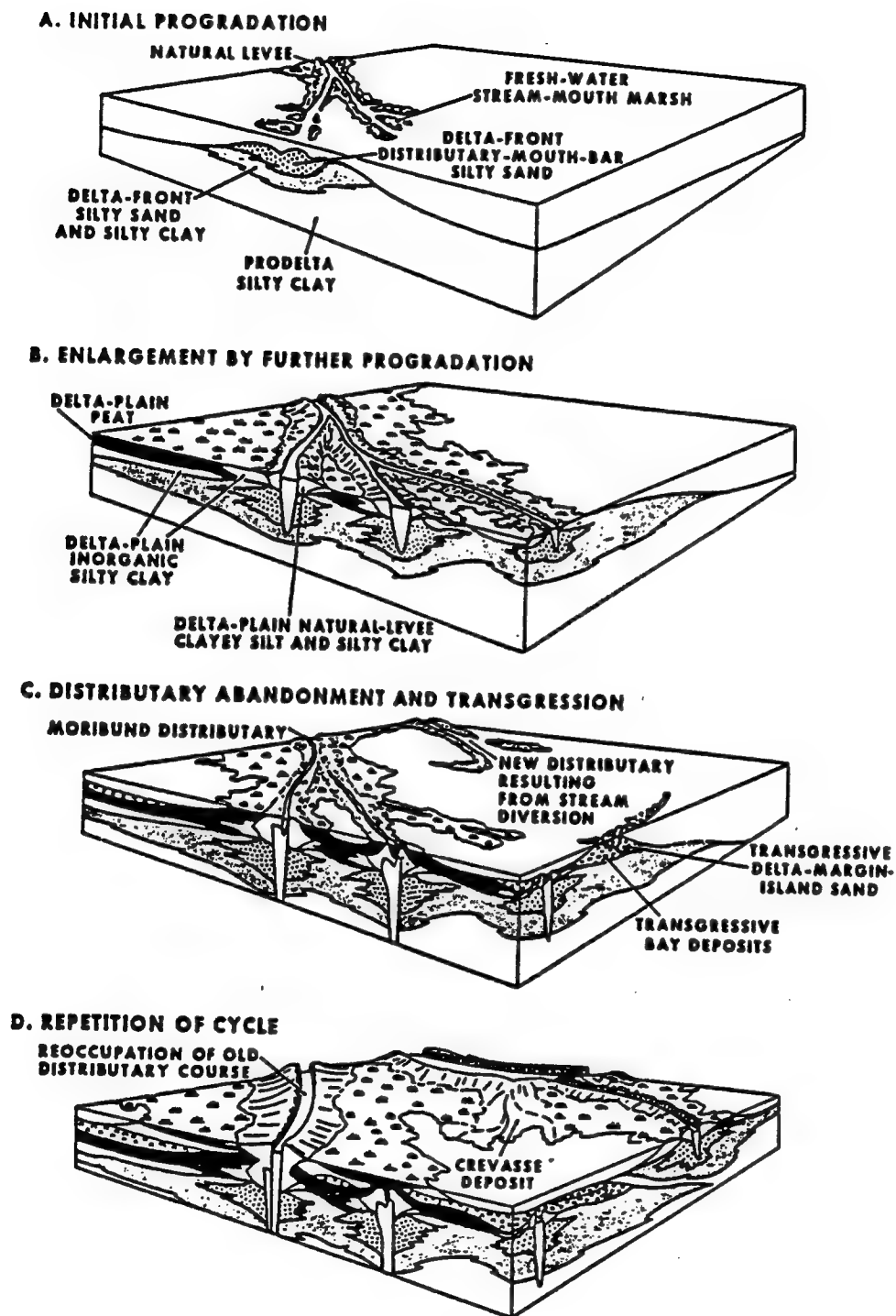


Figure 3. Stages of development for delta lobes. From Frazier (1967).

the mouth of the stream to become wide and shallow. This causes flow to be diverted to either side of the distributary-mouth bar at the mouth of the river, initiating the distributary network. Each functioning distributary continues to prograde, increasing the width of the deltaic platform. Overbank flooding deposits sediment between the distributaries, creating the interdistributary bays of the deltaic plain (Stage 2B). As flooding continues, natural levees develop and accrete as the result of coarser sediments (fine sands and silts) being deposited parallel to the stream due to a reduction in discharge velocity. Continued aggradation of the natural levees reduces the frequency of overbank flooding, permitting the establishment of vegetation (van Lopik 1955).

As distributary progradation continues, the stream becomes overextended. This results in a decrease of the slope of the stream, which causes a reduction in available stream energy. Velocity decreases and the stream becomes less efficient at transporting its heavy sediment load, resulting in aggradation of the channel. This causes an increase in stage levels upstream. Eventually the stream overflows its banks, forming a crevasse where the levee has been breached. At this point, the stream may divert its channel (Stage 2C) for a steeper, more efficient route to the gulf, prograding over the interdistributary bays. The abandoned distributary and associated deltaic plain begin to subside as a result of the loss of the sediment supply and the weight of the sediments of the distributary-mouth bar and levee on the unstable base of prodelta clays. Occasionally the abandoned distributary is reoccupied (Stage D), resulting in a repetition of the depositional stages (Frazier 1967).

Local Geomorphic Development. In 1996, the U.S. Army Corps of Engineers performed geomorphic investigations in the Cataouatche area. The purpose of these investigations was to "define the geomorphology of the project area in order to assist the archaeologist in identifying and evaluating cultural resources in the area affected by the proposed project" (U.S. Army Corps of Engineers 1996:1). A copy of the report is included as Appendix II.

Three distributary systems are known to have formed in the study area. The earliest system to develop was Bayou Segnette. Apparently the Bayou Segnette distributary was active prior to 3140 years B.P. This date came from a radiocarbon sample of peat overlying the natural levee deposits. The precise beginning of the Bayou Segnette system is unknown. Deposits from the Bayou Segnette distributary form the near surface sediments of the extreme eastern portion of the study area (U.S. Army Corps of Engineers 1996:10, 13, Figure 6).

The second distributary development occurred in the central portion of the study area. A radiocarbon date of 2950 years B.P. was attained from a peat sample. This sample was taken from a peat deposit which underlay the natural levee of one of the two small unnamed distributaries in the central portion of the study area. The exact origin of these distributaries is unknown, as subsequent Mississippi River deposition has obscured the original crevasse which created the distributary network (U.S. Army Corps of Engineers 1996:10, 13, Figure 6, 14).

The third and youngest of the distributary systems to form in the study area is Bayou Verret and its associated channels. The crevasse which created the Bayou Verret distributary system formed in the Davis Pond area to the north and west of the current study area (Britsch and Dunbar 1990:35; U.S. Army Corps of Engineers 1996:14). Samples of peat and organic clay from the VC-1 boring (on Bayou Verret) yielded radiocarbon dates from 2730 ± 80 to 1990 ± 60 years B.P. (Britsch and Dunbar 1990:B2). Thus, approximately 2500 years B.P., the Bayou Verret distributary system reoccupied and extended beyond channels formed during the earlier Bayou Cypriere Longue system (Britsch and Dunbar 1990:35). Within the study area, Bayous Verret and Gaudin are distributaries related to this system (U.S. Army Corps of Engineers 1996:14). Since the abandonment of the Bayou Verret system, no new distributaries have developed in the study area. Any subsequent sedimentation has occurred as a result

of overbank flooding and crevassing on the main course of the Mississippi River (U.S. Army Corps of Engineers 1996:14).

Soils

There are two soil associations present within the project area. The most extensive soil association is Westwego-Harahan (Matthews 1983:Sheets 6, 10, and 11). Westwego-Harahan soils occur in former swamps. They are level, poorly drained soils with clayey surface layers and subsoil. These soils currently are rarely flooded because they are drained by pumps and protected by levees. Elevation ranges from about 3' (0.91 m) below to 1' (0.3 m) above sea level with a slope of less than 0.5 percent. Westwego soils occur in lower areas. They formed in semifluid clayey alluvium and decomposed organic materials. These soils have a surface layer of very dark gray, firm clay with underlying subsoils of dark gray, firm clay; semifluid clay; and muck. The subsoil contains a network of permanent cracks as a result of artificial draining. The Harahan soils are slightly higher, and generally lack the thick organic layers found in Westwego soils. Harahan soils developed in clayey alluvium. They are very slowly permeable soils having a very dark gray surface layer; subsoil of dark gray and very dark gray, firm clay; and an underlying material of gray and dark gray, semifluid clay (Matthews 1983:51-56).

The other soil association in the project area, Barbary, is mainly restricted to an approximately 500 m (1640.4') wide section just east and north of Labranche Canal. Barbary soils are the dominant association in the 39 acre reforestation tract area (Matthews 1983:Sheet 11). With thin mucky surface layers and clayey underlying materials, Barbary soils occur in swamps that are flooded or ponded most of the time. Elevation ranges from sea level to about 2' (0.6 m) above sea level, with a slope of less than 0.2 percent. The surface layer is dark brown, semifluid muck. Underlying materials are dark gray, semifluid clay and mucky clay (Matthews 1983:48-49).

Climate

All of Louisiana is located within an area of humid meso-thermal climate of the humid subtropical type generally characterizing all of the Southeastern United States. Jefferson Parish is typified by long, hot, and humid summers. Winters are relatively warm, but occasional incursions of cool air do occur (Matthews 1983:2). The mean low in January averages 12° Centigrade (54° Fahrenheit) and a mean high in July of about 27° Centigrade (81° Fahrenheit). The growing season exceeds 260 days (White et al. 1983:103).

The area is located within the Subtropics, and its weather is strongly influenced by the nearby Gulf of Mexico. Rainfall exceeds 150 cm (59 in) annually. Periods of greatest rainfall generally occur in August and September. October is, on average, the driest month (White et al. 1983:103). Hurricanes and storm surges occur intermittently, and these have profound effects on floral, faunal, and human communities within the Barataria Basin.

Plant Communities

Elevation of the land dramatically affects distribution and composition of plant communities within the Barataria Basin. Differences of only a few centimeters of elevation are associated with striking changes in vegetation. This is largely the result of the effects of soil saturation (White et al. 1983:103).

Upland forests were historically confined to only the highest areas. At lower elevations, bottomland hardwood forests, cypress-tupelo swamp forests, and marshes were present.

An intermediate swamp may have been present at some locations between these two communities. Large tracts of marsh occur in surrounding areas (White et al. 1983:102).

Prior to cultivation and urbanization of the Mississippi River delta region, upland forests would have occupied most of the natural levee associated with the river itself. Similar plant communities remain present on the Pleistocene terrace north of Lake Pontchartrain. Natural climax vegetation in such forests is dominated by mixed deciduous and evergreen trees that are less tolerant of flooding than are bottomland hardwood species. Woody species in an elevated natural levee forest would have included oaks (*Quercus virginiana*, *Q. alba*, *Q. nigra*), shagbark hickory (*Carya ovata*), hackberry (*Celtis laevigata*), sweetgum (*Liquidambar styraciflua*), pecan (*Carya illinoensis*), magnolia (*Magnolia spp.*), and various pines (Bahr et al. 1983:82).

Bottomland hardwood forests are dominated by the water oak (*Quercus nigra*). Sub-dominants include the sweet gum (*Liquidambar styraciflua*), hackberry (*Celtis laevigata*), and live oak (*Quercus virginiana*). Other forest species include the box-elder (*Acer negundo*), honey-locust (*Gleditsia triacanthos*), American elm (*Ulmus americana*) and the Nuttall oak (*Quercus nuttallii*). The most common shrub species are palmetto (*Sabal minor*) and green haw (*Crataegus viridis*), but thickets of possum-haw (*Ilex decidua*) also occur. Within forest gaps, elderberry (*Sambucus canadensis*) and French-mulberry (*Callicarpa americana*) occur. Introduced species such as the camphor tree (*Cinnamom camphora*) are also present (White et al. 1983:103-104).

Vines are found throughout the bottomland hardwood forest, and few trees are observed without them. The most common of these include poison-ivy (*Rhus toxicodendron* var. *vulgaris*), Virginia creeper (*Parthenocissus quinquefolia*), supple-jack (*Berchemia scandens*), pepper-vine (*Ampelopsis arborea*), muscadine (*Vitis rotundifolia*), and hemp-weed (*Mikania scandens*) (White et al. 1983:104).

The cypress-tupelo swamp forests, located a greater distance from distributaries, are dominated by bald cypress (*Taxodium distichum*) in areas where they have been re-established after logging. Water tupelo (*Nyssa aquatica*) is often either a sub- or co-dominant species. Red maple (*Acer rubrum* var. *drummondii*) and ash trees (*Nyssa aquatica*) represent the other sub-dominants in this community. Shrubs include wax-myrtle (*Myrica cerifera*) and button-bush (*Cephalanthus occidentalis*), while vines are cat-briar (*Smilax spp.*), trumpet-creeper (*Campsis radicans*), and poison ivy. Herbaceous ground cover includes smart-weed (*Persicaria punctata*), alligator-weed (*Alternanthera philoxeroides*), swamp potato (*Sagittaria lancifolia*), and water hyacinth (*Eichhornia crassipes*) (White et al. 1983:105).

An intermediate swamp forest sometimes occurs between the bottomland hardwood forest and the swamp forest. The intermediate forest can be extensive due to the gradual slope of the land. Swamp red maple, American elms, and water oaks are common here. Palmettos create a dense understory, which is nearly impenetrable in some locations (White et al. 1983:105).

The other predominant plant community within the Barataria Basin occurs in the marsh areas. Marshes are categorized according to their degree of salinity, and the areas covered by the various marsh communities have certainly changed through the period of prehistoric occupation due to variation in fresh water influx compared to salt water intrusion.

The ecological distinction between a swamp and a marsh is the absence of trees in the latter. Marsh soils are peat and muck, and elevation of these is less than one meter above mean sea level in the vicinity of the study area. This elevation is comparable to that of Lake Salvador. Cord grass (*Spartina patens*) is dominant in the brackish or intermediate marsh,

while swamp-potato (*Sagittaria lancifolia*) predominates in freshwater marsh. Numerous other species co-occur with these marsh environments (White et al. 1983:106-107).

Fish

Barataria Basin hosts a diverse assemblage of species of fish. They are highly mobile, and seasonal movements of fish populations are widespread. The result is that marine fish penetrate inland to fresh water habitats, while fresh water species are sometimes found in more saline environments. Also, the lower reaches of freshwater streams probably serve as nursery areas for the young of some marine species (Bahr and Hebrard 1976:69).

Reptiles and Amphibians

Barataria Basin hosts at least 26 reptilian species, of which 14 are snakes. The American alligator (*Alligator mississippiensis*) and various species of turtle are common. At least 14 species of amphibians occur or are likely to occur in the basin. Most of these are frogs and toads (Bahr and Hebrard 1976:74-77).

Birds

At least 216 species of birds are known to occur in the Barataria Basin. Approximately 43 percent of these are passerines. Some species of this group are permanent residents, while others are only present seasonally. The remainder of the 216 species are predominantly waterfowl, many of which are migratory. Due to the basin's location at the terminus of the Mississippi flyway, which is the largest waterfowl migratory route in North America, birds represent a potentially abundant source of food, feathers, and bone for tools (Bahr and Hebrard 1976:67,78-115).

Mammals

Important fur-bearing species present within the basin are the muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), mink (*Mustella vison*) and otter (*Lutra canadensis*). Nutria (*Myocastor coypus*) are a recent introduction and were not present during the prehistoric or historic periods.

Other mammals known to occur in the area include the Virginia opossum (*Didelphis virginiana*), the nine-banded armadillo (*Dasypus novemcinctus*), the swamp rabbit (*Sylvilagus aquaticus*), the fox squirrel (*Sciurus niger*), the fox (*Vulpes fulva*), the bobcat (*Lynx rufus*), the beaver (*Castor canadensis*), the civet cat or spotted skunk (*Spilogale putoris*), and the white-tailed deer (*Odocoileus virginianus*). In addition, several species of terrestrial rodents and bats are endemic (Bahr et al. 1983:118-126). The mammalian faunal inventory would have been even more extensive during the prehistoric period (Speaker et al. 1986:26-29).

CHAPTER 3 ABORIGINAL OCCUPATIONS IN SOUTHEASTERN LOUISIANA

Introduction

This chapter presents a brief overview of Native American culture history in southeastern Louisiana. Sites discussed herein are listed in Table 1. In general, few sites dating to the Paleo-Indian or Archaic Periods have been reported in southeastern Louisiana (Gagliano 1963; Gagliano and Saucier 1963). Although land formation was occurring in the study area during the Archaic period, evidence indicates that human occupation occurred subsequent to maximum development of the distributary network. Additionally, Paleo-Indian and Archaic period sites are likely to have been deeply buried or destroyed by subsequent riverine processes.

Despite over 50 years of archeological research in the Barataria Basin portion of the coastal zone, basic culture historical and chronological subdivisions remain vaguely defined and poorly understood. The archeology of the Barataria Basin is, however, generally well understood in the broadest perspective of Lower Mississippi Valley prehistory.

The Poverty Point Period

The name Poverty Point is derived from the type site, an area of massive earthwork construction in northeast Louisiana (Ford and Webb 1956; Gibson 1983; Neuman 1984). The Poverty Point Site (16WC5) is believed to have been a cultural center with trade networks and influence extending throughout the Lower Mississippi Valley (Byrd 1991; Gibson 1983). Baked clay balls known as Poverty Point objects are one of the important traits that mark the period. Other traits include elaborate lapidary and microlithic industry, use of steatite vessels, and the importation and use of exotic non-local stone (Gibson 1983; Neuman 1984).

The earliest known sites in the vicinity of the study area are dated to the Poverty Point period. The Linsley (16OR40) and Garcia (16OR34) sites are located in Orleans Parish (Gagliano and Saucier 1963), and the Bayou Jasmine site (16SJB2) is located at the western end of Lake Pontchartrain (Duhe 1977; Gagliano and Saucier 1963:Figure 1). The Garcia site is situated on a buried natural levee associated with an early course of the Mississippi River. Located at the eastern tip of Orleans Parish, the site consisted of an eroding *Rangia* beach deposit. A series of radiocarbon dates, baked clay balls, and a characteristic Poverty Point artifact assemblage consisting principally of microlithic tools and a variety of chipped and polished stonework are evidence that date the site to the Poverty Point period (Gagliano and Saucier 1963:Table 1). Material dredged from the subsided *Rangia* shell midden at Garcia was used to define the Bayou Jasmine-Garcia Phase of the Poverty Point period (Gagliano and Saucier 1963; Gagliano et al. 1975:44-47).

Another important site representing this period and phase is the Bayou Jasmine site (16SJB2). Here, the evidence for a Poverty Point period occupation consists principally of baked clay Poverty Point objects quite similar in size and shape to those from the Poverty Point site (16WC5) (Gagliano and Saucier 1963:321). Duhe (1977:35-37) also reports the presence of small numbers of Poverty Point microtools and a relatively minor quantity of non-local lithic material, including unworked quartz crystals, orthoquartzite projectile points, worked hematite, steatite (which was rare) and an unidentified gray-brown chert. The Bayou Jasmine site also supported an extensive Tchefuncte component, along with later Marksville, Coles Creek, and Plaquemine occupations (Duhe 1977; Gagliano and Saucier 1963).

Archeological Site - 16SC42	Fleming - 16JE36
Archeological Site - 16SC43	Garcia - 16OR34
Archeological Site - 16SC45	Gibson Mounds - 16TR5
Bayou Cutler - 16JE3	Greenhouse - 16AV2
Bayou des Familles - 16JE218	Isle Bonne - 16JE60
Bayou Dupont-Dupre Cut Off - 16JE91	Kenta Canal - 16JE51
Bayou Gaudin - 16JE133	Linsley - 16OR40
Bayou Goula - 16IV11	Little Oak - 16OR7
Bayou Jasmine - 16SJB2	Mulatto Bayou - 16SB12
Bayou Ronquille - 16PL7	Poverty Point - 16WC5
Bayou Villars - 16JE68	Pump Canal - 16SC27
Bergeron School - 16LF33	Reforestation - 16JE26
Big Oak - 16OR6	Rosethorn School - 16JE50
Boudreaux - 16JE53	Shell Beach - 16SB39
Bowie - 16LF17	Shipyard - 16JE85
Bruly St. Martin - 16IV6	Sims - 16SC2
Buras Mounds - 16PL13	Tchefuncte - 16ST1
Coquilles - 16JE37	Thibodaux - 16AS35
Dupree Cut Off I - 16JE8	Three Bayou Field - 16JE98
Dupree Cut Off II - 16JE9	

Table 1. Louisiana Sites and Site Numbers Mentioned in Text.

The Tchula Period

Tchula period occupations in the Lower Mississippi Valley are equated with the Tchefuncte culture. The period has also been identified as the Formative (Jenkins and Krause 1986), or Early Ceramic period because, with the exception of fiber-tempered pottery, it was the interval during which initial pottery complexes appeared in the Lower Mississippi Valley (Neuman 1984:113, 122). Sites are few and scattered. Most occupations are found in the coastal zone (Neuman 1984). These data are interpreted to suggest that the peoples of the Tchefuncte culture were largely semi-nomadic hunters and gatherers (Neuman 1984:135). However, within subareas such as South Louisiana, regional artifact markers, primarily Tchefuncte type ceramics, are useful for recognizing occupations (Phillips 1970:7, 8, 15, 76) and possibly for defining regional populations (Shenkel 1981; Weinstein 1986).

Peoples of the Tchefuncte culture were the first to engage extensively in the manufacture of ceramics. Fiber-tempered and some grog-tempered or temperless sherds have been recovered from earlier Poverty Point contexts (Webb 1982). These may represent primarily trade goods from the earliest pottery-making cultures in the east. The basic Tchefuncte ware is temperless or grog-tempered, with accidental inclusions of small quantities of sand and vegetable fiber. Sand-tempered wares represent a minority constituent of Tchefuncte site assemblages (Shenkel 1984:47-48). Ceramic decorations and various percentages of these decorations have been used to create several regional phases of the Tchefuncte culture in the study area (Weinstein 1986). The Pontchartrain phase is considered the earliest Tchefuncte manifestation in the region and is thought to date from ca. 500 B.C. to ca. 250 B.C. Pontchartrain phase sites are moderately common in the Pontchartrain Basin. The most notable of these sites are the Tchefuncte site (16ST1) in St. Tammany Parish, and the Big Oak (16OR6) and Little Oak Island (16OR7) sites in Orleans Parish (Ford and Quimby 1945; Neuman 1984; Shenkel 1981, 1984; Shenkel and Gibson 1974). A later Beau Mire phase has been proposed to encompass the period from ca. 250 B.C. to A.D. 1, although this phase is not accepted by all researchers (Shenkel 1981, 1984; Weinstein 1986; Weinstein and Rivet 1978).

Tchefuncte sites in the vicinity of the study area are confined to the areas around Lake Pontchartrain and appear to be associated with relatively early river channels and lake margins. Tchefuncte subsistence is fairly well known. Excavations at the Big Oak Island and Little Oak Island sites suggest an emphasis on hunting and fishing (Shenkel 1981, 1984). Shenkel (1981:331) argues that these two sites initially had occupations which supported "permanent or semi-permanent villages." Later, there is evidence that there may have been functionally different occupations, with Big Oak Island evolving into a "specialized" shellfish and fish procurement and processing station (Shenkel 1981, 1984) which was "unquestionably associated with the contemporaneous village component at the Little Oak Island site" (Shenkel 1981:331-332, 1984). Shenkel (1981:333-334) emphasizes the narrow range of exploited foods (primarily *Rangia* clams and marsh-estuarine fish and mammals) in the Pontchartrain phase, noting that many other equally productive resources were virtually ignored.

Social complexity was relatively minimal in the Tchefuncte culture. Settlements are generally small and lack certain evidence of earth works or other complex features. Burials are common, but rarely, if ever, contain grave furnishings. The evidence for earthen structures, such as mounds, is debatable. Low, domed mounds have been associated with Tchefuncte culture sites, but the data for securely attributing these constructions to the Tchefuncte people are limited (Neuman 1984:117, 135; Toth 1988:27). Unlike earlier Poverty Point culture, Tchefuncte people did not import non-local or exotic lithics to their sites, nor did they, to the best of our knowledge, engage in lapidary art.

The Marksville Period

The Marksville period is generally subdivided into two sequential temporal units, early Marksville and late Marksville. The early Marksville period is associated with the Hopewellian Tradition manifested throughout the Eastern United States (Phillips 1970:7, 17-18, 886; Toth 1988). The Hopewell Tradition has two major centers of development in Ohio and Illinois; this tradition dates to between 200 B.C. and A.D. 400. Diffusion of aspects of the culture may have resulted from the activity of traders who established a wide-ranging network, sometimes termed the "Hopewellian Interaction Sphere" (Caldwell 1964). In addition to diagnostic pottery types of the Marksville period, conical burial mounds were characteristic of the culture (Toth 1988). Interments are generally associated with grave goods. Some of these artifacts were manufactured from exotic raw materials (Neuman 1984:142-168; Toth 1974, 1988).

The late Marksville period appears to witness an increase in cultural diversity in the Lower Mississippi Valley and possibly on the coast. In much of the Lower Mississippi Valley, the Issaquena culture developed over several centuries beginning around A.D. 200 (Greengo 1964; Gibson 1977; Phillips 1970; Williams and Brain 1983). In the Louisiana coastal zone, the cultural situation is very vague and poorly understood.

Early Marksville occupations in the eastern coastal zone are identified with the Labranche phase (Phillips 1970:898, Figure 444). The definition of Labranche phase sites principally consisted of sites at which the frequency of Crooks Stamped (now Mabin Stamped, *var. Crooks*) was equal to or greater than Marksville Stamped. As noted by Gagliano et al. (1979:4-4), the Labranche phase is "overextended geographically." Nonetheless, Labranche is still found as the phase name used in regional culture historical summaries (Perrault and Pearson 1994:Figure 6; Weinstein 1994:38, Figure 3-4), but it appears to be used only as a name to fill an otherwise blank space.

Excavations at the Coquilles site (16JE37) at the junction of Bayou des Familles and Bayou Coquilles yielded important evidence concerning the Marksville period occupation in the Barataria region (Beavers 1982a; Giardino 1984, n.d.). Surveys of the Bayou des Familles channel indicate the possible presence of Marksville period (phase or cultural relationship unknown) sites consisting principally of small shell scatters (Beavers 1982b). Evidently, there is an early Marksville occupation at the Boudreaux site (16JE53) located on the bank of Bayou Barataria near Crown Point (Beavers 1982a:26; 1982b:110).

Additional early Marksville occupations in the lower Barataria region include Kenta Canal (16JE51), Dupree Cutoff I (16JE8), Dupree Cut Off II (16JE9), Three-Bayou Field (16JE98), Isle Bonne (16JE60), and Bayou Cutler (16JE3) (Gagliano et al. 1979:4-8--4-19). The early Marksville occupation at Bayou Cutler is evidently the best representation of this time period outside of Coquilles (and possibly Boudreaux). Surface collected sherds from this site include Baytown Plain, *var. Marksville*, some with cross hatched and slanted line rim treatments. Decorated pottery consists of Marksville Incised, *var. Hill Bayou*; Marksville Stamped, *vars. Marksville, Old River, and Sunflower*; Mabin Stamped, *vars. Mabin and Point Lake*; Churupa Punctated, *vars. Boyd, Hill Bayou, and Unspecified*; and Indian Bayou Stamped, *var. Cypress Bayou* (Gagliano et al. 1979:4-3 - 4-5).

The late Marksville period occupation in the eastern Louisiana coastal zone is assigned to the Magnolia phase without attribution as to its cultural (as opposed to temporal) affiliation (Phillips 1970:898-899). The Magnolia phase is generally dated to the period ca. A.D. 200 - 400 (Perrault and Pearson 1994:Figure 6). Magnolia phase components were identified by the presence of specific rim modes and by the absence of Mabin Stamped, *var. Crooks* (formerly Crooks Stamped), and the presence of later Marksville markers, including Marksville

Stamped, ("probably but not necessarily" *var. Troyville*), Yokena Incised, and unspecified variants of Churupa Punctated (Phillips 1970:899). Based on the radiocarbon dates from the Coquilles site, it is evident that there was a late Marksville occupation associated with the midden deposits to the west of the mound area (Giardino 1984). Ceramics from the late Marksville component of the site included examples of Baytown Plain identified as being like *vars. Marksville* and *Satartia* (including rim modes similar to those associated with Issaquena, such as "Arcadia," "DeSha," and "Peak"); Marksville Incised, *vars. Marksville* and *Yokena*; Marksville Stamped, *vars. Manny, Newsome, and Troyville*; Churupa Punctated, *vars. Churupa* and *Thornton*; and rare examples of Catahoula Zoned Red (Giardino 1984:16-32). Radiocarbon dates identify this assemblage from ca. A.D. 319-650 at two standard deviations.

Late Marksville ceramics have also been recovered from sites farther down the Barataria waterway. Most notably, there is a small but well-defined component at the Bayou Cutler site (Gagliano et al. 1979:4-19 - 4-27, Figures 4-17 and 4-18, Appendix A). Additional components include Isle Bonne (16JE60), Kenta Canal, Fleming (16JE36), Bayou Villars (16JE68), Rosethorn School (16JE50), Shipyard (16JE85), and Bayou Dupont-Dupre Cut Off (16JE91). Ceramics from these sites include classic modes on Baytown Plain, *var. Satartia*, and Marksville Incised, *vars. Goose Lake, Liest, and Yokena* (Gagliano et al. 1979: Figures 4-17 and 4-18).

The Baytown Period

The Baytown period has been defined as the interval between the end of Hopewellian inspired Marksville culture and its later Issaquena and related descendants, and the emergence of Coles Creek culture. The Baytown period is often referred to as the "Troyville period" by Delta archeologists. Due to the perceived lack of diagnostic markers for the period in southeastern Louisiana, it is often assimilated with the subsequent Coles Creek period, and the two are together referred to and discussed as "Troyville-Coles Creek cultures" (e.g., Neuman 1984).

Historically, the interval between roughly A.D. 400 to 700 has been one of the most difficult to understand from a culture historical perspective (Kidder 1995:33-34). When Phillips (1970:911-912) established the Whitehall phase to encompass the Baytown period in the Louisiana coastal zone, he specifically noted that the phase "would be more accurately described... as a collection of widely dispersed sites" (1970:911) rather than a coherent archaeological manifestation. Kidder (1994a) has argued that Whitehall is not an appropriate phase for this region. Whitehall is better represented in the areas north of the Barataria Basin (Weinstein 1994). Furthermore, Kidder (1994a) argues that the Baytown period in the Barataria Basin, and probably all of coastal Louisiana, may be subdivided temporally into early and late phases. The earliest phase of the Baytown period in coastal Louisiana has been termed the Grand Bayou phase, and the later phase is the Des Allemands phase (Giardino 1993; Kidder 1994a).

The "type" site for Baytown period occupations in the lower Barataria region is the Isle Bonne site (16JE60) (Beavers 1982b; DeMarcay n.d.; Holley and DeMarcay 1977). Amateur excavations at this site revealed a stratified Baytown period occupation associated with two low rises formed by the accumulation of *Rangia* shell (DeMarcay n.d.; see also Gagliano et al. 1979:Appendix A). Ceramics recovered included Larto Red, *var. Larto* (often with bulbous thickened rims); Coles Creek Incised, *var. Phillips*; French Fork Incised, *var. Brashear*; Woodville Zoned Red, *var. Woodville*; Evansville Punctated, *var. Unspecified* (probably similar to *var. Duck Lake*); Indian Bay Stamped, *var. Unspecified*; Marksville Incised, *var. Unspecified* (Vick-like); and Mazique Incised, *vars. Bruly and Mazique*.

The Grand Bayou phase is marked by the presence of the so-called terminal Marksville ceramic tradition, characterized elsewhere by local analogs to Marksville Incised *vars.* *Anglim* and *Vick*, and Marksville Stamped, *var. Bayou Rouge*. Larto Red pottery is evident, as are late variants of Churupa Punctated, especially something similar to *var. Watson*. Rim modes include characteristic early Baytown thickened rim modes and rim and lip notching. Plain pottery consists of relatively thick, coarse grit-grog tempered plain pottery. This later phenomenon, the use of very thick coarse plain ware, may be diagnostic of the Grand Bayou phase, at least along Grand Bayou. Grand Bayou phase components have been identified at Bruly St. Martin, Shell Beach, Gibson Mounds, 16SC42, 16SC43, and 16SC45.

Des Allemands phase components can be identified in stratigraphically unmixed contexts, but are difficult to separate from the early Coles Creek Bayou Cutler phase (Giardino 1993). The use of the "six mile" treatment may be one of the best and most consistent diagnostic hallmarks of the Des Allemands phase, although it certainly is continued into the Coles Creek period. A characteristic of the Des Allemands phase is single- and possibly double-lined examples of Coles Creek Incised, often with incisions on thickened rims. Early Mazique Incised variants are found for the first time, and are especially notable for the initial appearance of Mazique Incised, *var. Bruly*. Thick, coarse grit-grog tempered plainwares dominate collections, but sand added to the paste achieves a brief period of popularity. The Isle Bonne site is essentially the type site for the Des Allemands phase.

Evidence for Baytown period occupations within the study area is scarce. The Gheens Crevasse system, on the east side of Bayou Lafourche, appears to have seen the beginning of extensive human occupations during the late Coles Creek period (Hunter et al. 1988:154; Pearson et al. 1989). A few of the sherds recovered during the survey of the Golden Ranch area suggest occupations prior to A.D. 1000; however, these are "questionable" (Hunter et al. 1988:154).

Grand Bayou and Des Allemands should be considered phases of the so-called "Coastal Troyville" culture. Grand Bayou demonstrates ceramic affinities to phases up the Mississippi River, especially the Troyville culture phases at Greenhouse and in the Tensas Basin. Grand Bayou is not the same culturally as the Troyville peoples living in the Mississippi River Valley proper, however. Absent on the coast are the distinctive site plans, site hierarchies, burial mounds and mortuary patterns, and the total ceramic repertoire. This "Coastal Troyville" culture seems to represent a hunting and gathering society widely distributed across the habitable parts of the coastal zone (Giardino 1993). Although farther north and to the east contemporary groups constructed mounds and earthen platforms (Blitz and Mann 1993; Kidder and Wells 1992), there are not certain data to substantiate this practice in the Delta.

In contrast to the Grand Bayou phase, the Des Allemands phase peoples seem to have a more eastern orientation (Giardino 1993). It is at this time that we see the beginnings of what appears to be relatively intensive interaction with Weeden Island or Weeden Island-related groups along the eastern gulf Coast (Belmont 1967; Belmont and Williams 1981). Although these external connections are notable, the peoples of the Louisiana coastal zones were developing their own unique adaptations to the delta environment of the Mississippi River. Des Allemands phase ceramics mirror a broad trend in Lower Valley prehistory marking the origins of later Coles Creek patterns.

The coastal pattern of intensive exploitation of fish, deer, and muskrat is in place by the end of the Baytown period. Shellfish harvesting or exploitation continues, but little evidence for settlement differentiation exists at present. The data recovered from the Pump Canal site hint at a series of relatively brief occupations, and the *Rangia* seasonality data indicate a late spring or early summer occupation (Jones et al. 1994). Perhaps at this time, populations living in the Barataria Basin were making seasonal trips to the distal ends of distributary

courses to hunt, fish, and exploit the *Rangia* beds in the nearby brackish water environments. If this was a part of a seasonal round that involved living in larger, more established villages, such sites have not yet been found. Possibly Bruly St. Martin, located well into the interior of the Barataria Basin, might qualify for such a village location.

Given our limited data, it is difficult to establish any socio-political patterning with confidence. It appears that the Des Allemands phase peoples were egalitarian hunter-gatherers. The data are at present too equivocal to determine whether or not mound-building was occurring during the Baytown phase on the coast (Weinstein et al. 1978), and no strong site hierarchy has yet been identified. Site differentiation may exist, but what evidence there is indicates that site function plays the determining role in the size and nature of site occupation.

The Coles Creek Period

The Coles Creek period is the interval that begins with the emergence of Coles Creek culture in the southern part of the Lower Mississippi Valley and ends with the establishment of "full-blown" Mississippian culture in the northern part of the Valley (Phillips 1970:18). Although it appears to represent a population zenith in the eastern coastal zone, many sites tentatively classified as Coles Creek may actually be from the Baytown period (Wiseman et al. 1979:3/5).

Coles Creek culture in the central Lower Mississippi Valley is characterized by small ceremonial centers with mounds. These were surrounded by villages of varying size. The culture developed in the area between the mouth of the Red River and the southern part of the Yazoo Basin. A distinctive coastal variant of Coles Creek culture emerged at the same time, and no doubt there was a dynamic relation among Coles Creek period populations on the coast and in the interior (Brown 1984:95; Jeter and Williams 1989).

Mounds associated with the Coles Creek culture generally are larger and exhibit more construction stages than those found at earlier Marksville period sites. A more significant difference is that Coles Creek mounds are pyramidal and flat-topped, and they were used as substructures for religious and/or civic buildings (Ford 1951; Williams and Brain 1983). In contrast, Marksville peoples generally built conical burial mounds (Neuman 1984:167).

The advent of the Coles Creek period in the Louisiana coastal zone is marked by changes in ceramic frequencies and, to a lesser extent, by the appearance of new types or varieties and the disappearance of others. More fundamental patterns of economic and social behavior also change, but at a seemingly slower rate. Unlike previous periods, Coles Creek is well known, at least in terms of the ceramics. Typical ceramics include Pontchartrain Check Stamped, Coles Creek Incised, French Fork Incised, Mazique Incised, Chevalier Stamped, Beldeau Incised, Chase Incised, Rhinehart Punctated, and "Coles Creek rims" (Phillips 1970:921). In the Lower Mississippi Valley, Coles Creek has been divided into early, middle, and late phases (Phillips 1970; Williams and Brain 1983). More recently, however, a fourth, usually "transitional" Coles Creek (or in some cases early Plaquemine) phase has been added (Brown 1985; Kidder 1994b; Weinstein 1987).

The archeological record of south Louisiana is sufficiently detailed so that the Coles Creek period is divided into spatially discrete geographic areas. In the coastal zone, there are at least three geographic areas with two Coles Creek phases each. In the eastern portion of the coastal zone, from roughly the Atchafalaya eastward to the St. Bernard marshes, the Coles Creek is defined to include the Bayou Cutler, Bayou Ramos, and St. Gabriel phases (Weinstein 1987).

The settlement patterns of the Coles Creek period are not well understood at this time. There is a general sense that populations were organized into a relatively loosely arranged hierarchy of site types. The best defined model comes from the Terrebonne marsh area west of the Barataria Basin. Here, Weinstein and Kelley (1992) hypothesize a pattern of major mound sites, satellite villages, and seasonal camps or shellfishing stations. The mound sites consist of one or more earthen mounds, presumably supporting the structures of elite chiefs and/or priests. They suggest that the Gibson Mounds may have served as the major Coles Creek period mound center in this area, although the precise chronology of all the mounds is yet undetermined. Most, if not all of Mound C at Gibson Mounds appears to have been constructed during the Bayou Cutler phase. Smaller village sites are found along stable levee segments, usually at the junction of one or more tributaries.

In the Barataria Basin, the archeological data are not adequate to fully address the nature of settlement and social organization. Excavations at the Fleming site (16JE36) indicate that Coles Creek period occupations comprise a considerable portion of the vertical extent of this site (Holley and DeMarçay 1977). Along with the Bayou Villars and Isle Bonne sites, Fleming makes up one of the important "Barataria complex" occupations (Gagliano et al. 1979; Holley and DeMarçay 1977). This locality is presumed to be the major center for Coles Creek and Mississippi period settlement in the lower part of the Barataria Basin. All three of these sites support earthen or shell mounds, although none can be solely assigned to the Coles Creek period (Gagliano et al. 1979).

There were major Coles Creek occupations at both the Sims (16SC2) and Bowie (16LF17) sites, and numerous Coles Creek period occupations can be found in the intertributary basin between bayous Lafourche and Barataria (Hunter et al. 1988; Pearson et al. 1989). The density of Coles Creek occupation in this area is remarkable and suggests that this region was one of the central loci of activity during this period. Sims and Bowie are presumed to be major villages dating to the Coles Creek period (Davis and Giardino 1981; Jackson 1977). Numerous Coles Creek occupations are found on Bayou Barataria and its distributaries south of the confluence with Bayou Villars. The Pump Canal site can also be hypothesized to be an important village occupation during the Coles Creek period (Giardino 1993; Jones et al. 1994). It may have been an important locality serving as a "base camp" for exploiting the resources of the surrounding marshes and lakes.

In the eastern section of the coastal zone, from the Atchafalaya Basin eastward, Weinstein (1987) observed that the Transitional Coles Creek/Plaquemine occupations were best defined as an extension of the St. Gabriel phase. This phase was first defined by Brown (1985) based on excavations at the type site (16IV128) (Woodiel 1980). St. Gabriel or contemporary occupations are found at Mulatto Bayou (16SB12), Thibodaux (16AS35), and Bergeron School (16LF33) (Weinstein 1987:93). Ceramic varieties such as *Mott* and *Plaquemine* are absent in the eastern delta.

The available data from surrounding areas suggest that the Transitional Coles Creek/Plaquemine occupation of the Barataria Basin was largely unchanged from earlier Coles Creek times. The major settlements continue to be located along Bayou Barataria or farther inland on the distributary channels of Bayou Lafourche or at the edges of large crevasse splays. The largest site of this time appears to be the Bowie site (Jackson 1977). A contemporary component is also found at the Sims site. The concentration of sites at the junction of Bayous Barataria and Villars is the best candidate for regional center in the Barataria Basin, but the precise chronology of these sites is still unknown.

Although Brown et al. (1979) note that important changes in settlement (and presumably subsistence) are initiated during Transitional Coles Creek/Plaquemine times in the Petit Anse region, no such evidence is found in regions to the east. In the Terrebonne marshes, the

settlement pattern evidently continues unbroken from earlier times (Weinstein and Kelley 1992:353-355). The quantity of mounds constructed appears to increase through time, but the number that date to this interval cannot be determined at present. A clear mound center and subsidiary village hierarchy developed during the Coles Creek period and probably continue into these transitional times. The trend in the coastal zone is one of gradual, but steady evolution within the region. External influences may be present, but they do not appear to be notable in terms of the process of culture change. The origins of the Mississippi period cultures of the coastal zone seem to be wholly local. Later events, though, seem to suggest that this region witnessed a significant influence from Mississippian groups farther eastward along the coast.

The Mississippi Period

The beginning of the Mississippi period is marked by the appearance of emergent Mississippian culture in the northern part of the Lower Mississippi Valley and throughout much of the interior Southeast. Mississippian culture characteristics, such as shell tempering and the use of maize agriculture, did not penetrate into much of the central Lower Valley until after ca. A.D. 1200. Plaquemine culture is the term used to denote the indigenous late prehistoric populations of most of the Lower Mississippi Valley and adjacent coastal regions. Archaeological evidence suggests that Plaquemine culture emerged from a Coles Creek base and was later influenced by Mississippian intrusions from farther up the Mississippi River Valley. Multi-mound construction and artifact assemblages are evidence that link the two. Absence of European trade goods indicates that the Plaquemine culture reached its zenith prior to European contact (Neuman 1984:258-259).

The late prehistoric culture history and chronology of the eastern portion of the Louisiana coastal zone is not well understood at present (Jeter and Williams 1989:191). The data indicate that local Plaquemine populations in the region developed out of the Transitional Coles Creek/Plaquemine beginning at roughly A.D. 1200 (Jeter and Williams 1989:191-195; Weinstein 1987). At roughly the same time, however, Mississippian ceramics (and possibly peoples), which are identified with the Pensacola variant of Mississippian culture, enter into the area from the east, presumably via the Gulf Coast. Sites in the eastern coastal zone with shell tempered pottery in large quantities are identified with the Bayou Petre phase, while late prehistoric sites in the area without shell tempered pottery, and which show evidence of more Lower Valley ceramic characteristics, are identified with the so-called Delta-Natchezan phase. Although these Mississippian ceramics tend to be found primarily in the easternmost part of the region, Mississippian Bayou Petre phase pottery is not wholly confined to this region (McIntire 1958). To further complicate the picture, there is increasing evidence that the late prehistoric populations in the Barataria Basin integrated some of the Mississippian designs and styles into the local ceramic repertoire (Davis and Giardino 1981).

The Plaquemine occupation of the Barataria Basin and adjacent parts of the coastal zone is designated the Barataria phase. This phase was defined by Holley and DeMarcay based on amateur excavations conducted at the Fleming site (Holley and DeMarcay 1977; Manuel 1984). Fleming consists of at least one earth and shell mound, and a shell midden (Holley and DeMarcay 1977:4; Weinstein 1987:96). The Fleming site is one of three apparently contemporary occupations at the junction of Bayou Barataria and Bayou Villars. The Isle Bonne and Bayou Villars sites also consisted of earth and shell middens and mounds (Gagliano et al. 1975:24, 58, 1979; Holley and DeMarcay 1977; Weinstein 1987:96). As noted by Weinstein (1987:96), "this large mound complex forms the hub of the Barataria phase."

The Barataria phase is differentiated from the contemporary Medora phase of the Mississippi Valley by the absence of Plaquemine Brushed pottery and by the extensive use of so-called Southern Cult motifs in association with typically Lower Valley pottery such as Anna

Incised and L'Eau Noire Incised (Holley and DeMarcay 1977; Weinstein 1987:96). The Barataria phase ceramics, however, are otherwise Plaquemine in composition. Major types and varieties associated with this phase include L'Eau Noire Incised, *vars.* *L'Eau Noire* and *Bayou Bourbe*; Carter Engraved; Maddox Engraved; and Mazique Incised, *var.* *Manchac* (Holley and DeMarcay 1977:14-18).

With the decline of Moundville and its influences across the Gulf Coast in the later part of the fifteenth century, the deltaic part of the coastal zone again saw a renewed emphasis on indigenous styles in ceramics. The so-called Delta Natchezan phase represents the final late prehistoric phase in the region. Ceramics of this phase show a strong continuity from the Barataria/Bayou Petre phase occupations in the region, with the addition of pan-Lower Valley varieties such as Fatherland Incised, *vars.* *Fatherland* and *Bayou Goula*. Shell tempering continues as an important, but not unique, characteristic in the ceramics from the region (Giardino 1985).

The largest excavated late prehistoric site in the deltaic portion of the coastal zone is the Sims site (Davis 1981; Davis and Giardino 1981; Giardino 1985). Excavations in areas 1 and 3 at Sims revealed Mississippi period deposits attributable to the Bayou Petre and Delta Natchezan phases. Excavations in area 3 at Sims revealed a late Mississippi period component thought to be related to the terminal occupation at the Bayou Goula site and possibly dating to the protohistoric or early historic period (Giardino 1985).

The Bowie site also contained a minor Bayou Petre or Delta Natchezan phase occupation (Jackson 1977). During this late prehistoric period, archeological sites are found across much of the marsh and levee lands of the eastern coastal zone. Collections from the Buras Mounds (16PL13) and from the Bayou Ronquille site (16PL7) demonstrate that there were important mound occupations located near the modern day coast and associated with recent distributary channel courses (see Kniffen 1936; Weinstein 1987).

The Bayou des Familles channel appears to witness an increase in occupation frequency during the late prehistoric and into the historic periods (Beavers 1982b; Franks and Yakubik 1990; Fuller 1991; Yakubik 1989). Mississippi period sherds at a number of small shell middens along the bayou suggest that either larger populations were exploiting the region, or that they were visiting the area more frequently. None of the Mississippi period sites are large, nor do they show evidence of the building of typically Mississippian site plans or features (mounds, mound-plaza arrangements). The radiocarbon dates from the Bayou Des Familles site (16JE218), in conjunction with the ceramic assemblage, however, demonstrate that both shell tempered and clay/Addis pottery were being used at the same time.

In contrast to the Petit Anse region, the eastern coastal zone does not witness very dramatic changes in settlement during the post-Coles Creek era. However, several important trends become evident. First, we see an expansion of settlement into more recently formed marsh areas and along peripheral distributary channels adjacent to the essentially modern course of the Mississippi River. Sites such as Buras Mounds and Bayou Ronquille are good examples of this trend (Kniffen 1936; Weinstein 1987). There is also an evident pattern of nascent settlement coalescence focusing on relatively centralized, frequently mounded, communities. In the eastern coastal zone, we see the formation of a small number of large mound groups which appear to be the central focus of occupation in the region. Other than these mound sites, though, large late prehistoric sites are not especially evident. Bayou Petre and Delta Natchezan non-mound sites are small, and generally are associated with well-elevated stretches of levees. The typical Coles Creek marsh adaptation appears to have been abandoned for one presumably more focused on the cultivation of domestic crops in well-drained areas.

The subsistence and sociopolitical organization of the late prehistoric period is not well documented. A small amount of corn was recovered from uncertain contexts at the Fleming site. Analysis of the fauna from Sims indicates that the later prehistoric inhabitants of the site exploited a narrower range of animals, and placed less emphasis on marsh species, notably alligator and muskrat. At Pump Canal, however, the post-Coles Creek occupants appear to have carried on with a marsh oriented subsistence patterns, focused on muskrat, raccoon, deer (to a lesser extent), fish, and amphibians (Misner and Reitz 1994; Smith 1996). This late prehistoric occupation (or occupations) appears to have been relatively transient and may represent the shift from village type occupations to more temporary, possibly seasonally occupied, camps. Changes in faunal exploitation and settlement type at Pump Canal appear to correlate with changes in local environments (Jones et al. 1994). Ethnohistorical data from the region suggest that the Chitimacha Indians practiced a mixed fisher-farmer-collector subsistence strategy. Maize and other cultigens were planted on elevated plots of land, frequently along bayous, with populations periodically (perhaps seasonally?) ranging out to marshes and lakes to gather shellfish and to fish. In the early historic period, the Chitimacha evidently moved in mixed-sex family groups, and they may have spent much of the summer away from their garden plots.

There is little doubt that the late prehistoric Indians of the eastern coastal zone lived in stratified chiefdom level societies at the time of early European contact. Weinstein and Kelley (1992) suggested a hierarchically organized settlement pattern for the late prehistoric communities in the Terrebonne marsh area, which involved mound communities, lesser villages, and seasonal resource collecting stations or camps. Along Bayou Lafourche, Altschul (1978) identified two temporally distinct patterns, that corresponded to what were identified as Plaquemine and Mississippian cultural occupations. The earlier, Plaquemine pattern evidently involved a seasonal pattern of movement focused on a centralized fall/winter community located on interior forested levees. Spring/summer occupations consisted of dispersed habitations spread across most major landforms, which especially emphasized the exploitation of marsh and coastal resources (Altschul 1978:184-186). Evidence for status differentiation in and among these communities was minimal (Altschul 1978:186). The second pattern described by Altschul was associated with the "Mississippian" occupation of the region (1978:186), with large, sedentary mound communities occupying elevated levees. Altschul hypothesized that "a sizable proportion of the villagers lived in dispersed homesteads" (1978:186). He further inferred that, "While there is no definitive evidence, the location and complexity of these sites indicates that plant domesticates were heavily utilized" (Altschul 1978:186).

Summary

The archeology of the eastern coastal zone is only now beginning to come into focus. Truly, we are just starting to develop an appreciation for the complexity evident in the region. There is a strong correlation between the regional culture history and changes in the environment caused by shifts in the Mississippi River's course. Native Americans in the region adapted themselves to these changing environments in a number of ways. The initial occupation of the eastern coastal zone was during the Poverty Point period. We know little about these occupations in terms of subsistence or social organization. Evidently some of these coastal populations were participating in the widespread Poverty Point interaction sphere.

The first well-recognized occupation of the region occurred during the early Woodland and is associated with the Tchefuncte culture. Tchefuncte occupations are especially common along Lake Pontchartrain, but are infrequent farther south. Some tentative evidence suggests that it was at this time that humans began to move into the lower Barataria region.

The succeeding Marksville period witnessed an expansion of human populations into newly formed lands within the study area and marks the first extensive colonization of the lower Barataria Basin. Excavations at the Coquilles and Boudreaux site indicate the presence of an extensive and perhaps intensive early Marksville period occupation. However, neither site has yielded evidence for the complex mortuary programs, trade contacts, or social complexity normally associated with Marksville culture.

Late Marksville occupations are also evident in the eastern coastal zone. Based on the ceramics, these appear to be similar to those identified with the Issaquena culture farther north, but specific cultural connections have not been illuminated due to a lack of well-controlled excavations. Several important components of this time period have been suggested, most notably at Coquilles and Bayou Cutler, but once again, specific data and exact chronologies are lacking.

During the Baytown period, the coastal zone witnesses an increase in population or at least habitation. The lower Barataria Basin is home to several sites of this period, notably Isle Bonne, which appears to date to the later part of the Baytown sequence. We can speculate that at this time there was a movement of peoples out from the interior part of the basin towards the marsh and coast to the south.

The pattern noted in the Baytown period continues in the Coles Creek period. Populations continue to expand along the coastal zone, especially along channels extending into the marsh. Some parts of the Barataria region see fairly intense occupations. This is especially notable south of the confluence of Bayous Barataria and Villars, and to the west in the Bayou Des Allemands region extending to Lake Salvador. Coles Creek peoples seem to be very intensively exploiting marsh habitats. They do not appear to have been cultivating domesticated plants.

During the Mississippi period, we see a gradual shift from the Coles Creek pattern of marsh exploitation towards one evidently oriented towards agricultural practices. There is little change during the early part of the period. By the Barataria phase, there may be some contraction in the number of sites and the range of exploitation. There is an increasing emphasis on larger, possibly more permanent settlement along well-drained levees. A distinctly bimodal settlement pattern evolves by ca. A.D. 1300-1400, with large villages, frequently with mounds, being located on well drained soils, and with small, dispersed communities scattered across most of the major landforms. By the late prehistoric period, this pattern seems to be emphasized, especially along the major tributaries and waterways. Major mound centers were probably the locations of ruling civic and religious elite, and small dispersed settlements are likely to have been dependent on the larger centers in an economic or political sense.

CHAPTER 4 HISTORIC OVERVIEW

Overview of the Project Alignment Area

The project alignment transects an area of natural marsh and swamp on the west bank of the Mississippi River from near the St. Charles Parish/Jefferson Parish line to the vicinity of Bayou Segnette. The historic use of the area has been determined by its natural characteristics. Since lands in proximity to the project area are not naturally suitable for agriculture, they were not used for farming or settled until technology allowed substantial draining. For the most part, the project alignment is located behind the eighty-arpent line from the Mississippi River. This area was not surveyed and claimed until after the Civil War. Even drainage advances in the second half of the nineteenth century had little effect on the area in proximity to the project alignment, which continued to be utilized for hunting and fishing rather than as a location for settlement. During the nineteenth century, several canals with outfalls into Lake Cataouatche were excavated to drain lands lying behind the natural levees of the west bank of the Mississippi River. These early drainage canals had relatively little impact upon the natural landscape in the vicinity of the project alignment.

The first major land-use impact on the area was the extraction of cypress from those areas where this tree grew, specifically the Barbary soil areas to the north and at the east end of the project alignment. The period of industrial cypress lumbering in Louisiana lasted from about 1890 to about 1925, by which time nearly all large stands of old-growth cypress in the state had been depleted. Cypress lumbering had severe ecological effects upon the landscapes where it was undertaken. Several marsh reclamation projects were undertaken in west Jefferson Parish during the early part of the twentieth century. One of these projects involved Churchill Farms, which is discussed in detail below. After about 1910, petroleum extraction began in swamp, marsh, and open-water areas of the state. Oil and Gas maps and aerial photographs of the project area provide an indication that limited petroleum extraction had begun in proximity to the project alignment by the World War II period. Petroleum extraction in the area accelerated after 1950 and most dramatically through the first half of the 1960s, when large numbers of channels were cut through the marshes and swamps of the project area for petroleum exploration, well access, and pipelines. Construction of the Inner and Outer Cataouatche canals in the mid-1960s resulted in a very important impact upon the landscape in proximity to the project alignment and resulted in major alteration to ecological conditions in a much wider area. This was particularly true for the area within the hurricane protection levee, which experienced substantial development in the period after 1965 in the vicinities of Wagaman, Avondale, and the Westwego Oil and Gas Field.

The Churchill Farms Site

That portion of the survey area within Sections 19 and 22 of Township 14 South, Range 23 East (Figure 1) was part of the Churchill Farms tract after 1911. Sections 19 and 22 were unclaimed and vacant throughout the antebellum period. Both sections were first surveyed in August 1872 by surveyor R.P. Fontcuberta (Township Plat Book, Jefferson Parish). The sections were part of a large area of Jefferson Parish west bank swamp and marsh lands that devolved to the ownership of the Lafourche Basin Levee District. The Levee District sold off these lands piecemeal, and on May 3, 1904, Section 22 was part of a large tract purchased by Edwin C. Brady and Dr. C. Milo Brady of Jefferson Parish (COB 23:549). Evidently, Section 19 was subsequently conveyed with Section 22, but the date of the original purchase of Section 19 is not clear from the conveyance records. Edwin P. Brady also bought huge tracts of Jefferson Parish swamp and marsh lands in partnership with Henry L. Zander at approximately the same time. Edwin P. Brady bought out Dr. C.M. Brady's interest in Section 22 on December 15, 1905, and on April 21, 1906, transferred ownership of Section 22 to the Acme

Land and Timber Company (COB 25:452). From at least 1906 to 1910, Edwin P. Brady was the president of the Acme Land and Timber Company. Henry L. Zander was secretary of this company in 1907 (Soards' 1900-1910). It is highly likely that the marketable timber was removed from the area around Sections 19 and 22 by the Acme Land and Timber Company between 1906 and 1908. In the latter year, Acme failed to pay taxes on this section. It was not an uncommon practice for timber companies not to pay taxes on swamp lands after they had been logged. Before the mineral boom that accelerated in the 1910s, the value of swamp property was often measured by the market value of the timber on it, and it was considered otherwise worthless (c.f. Vigander and Maygarden 1994).

On July 3, 1909, Section 22 was sold in a sheriff's sale to James S. Brady, who sold it on December 5, 1910, to John A. Kruse, for \$12.50 an acre (COB 30:102). John A. Kruse was a professional engineer and had been active in reclamation projects in Louisiana since about 1880. By the 1910s, Kruse was head of the John A. Kruse Engineering Co. of Chicago as well as a nationally-known reclamation expert, having worked in Drainage District No. 1, later known as Subdrainage District C, in St. Bernard Parish (Chappuis n.d.:97). In 1909, Kruse had published an article entitled "The Feasibility and Cost of Reclamation of the Swamp or Wet Prairie Alluvial Lands of Southern Louisiana" (Kruse 1909). On March 9, 1911, John A. Kruse sold Section 22 as part of a 6500 acre tract to A.J. Churchill, a Chicago clothier who was president and treasurer of the Eddick Land and Reclamation Company (COB 30:308; *Times-Picayune* 1925). Kruse remained as secretary and general manager of the reclamation effort on a 1000-acre portion of the Eddick tract, which was named "Churchill Farms" (*Times-Picayune* 1925; Gillen 1927). Beginning in 1919, A.J. Churchill also began to issue mineral leases for the tract including Section 22 (COB 46:179).

The Churchill Farms reclamation project was initiated in the heyday of drainage projects in southern Louisiana, which reached a peak in the period from 1915 to 1920. Kruse and Churchill may have been partly inspired by the seeming success of Winter Gardens, a reclamation project begun in 1910 on the west bank of Lake Cataouatche by Chicago Attorney Cornelius Jon Ton and his New Orleans Netherlands Company (Reeves 1996:77). The difficulties of successfully operating reclaimed lands for agricultural purposes were already evident by 1920, and of the large number of reclamation projects attempted in southern Louisiana, the vast majority (including Churchill Farms) ultimately failed. In almost all cases these failures were due to the unsuitability of ecology to crop agriculture or livestock raising (Gagliano 1973).

Kruse was confident that he had learned from the mistakes of previous reclamation projects. A comprehensive survey of the Churchill Farms tract was made as to timber, submerged stumps, soil, and other characteristics. Two thousand soil samples were taken by borings to an average depth of 15 feet, and from the data were prepared sub-soil maps on which the drainage work was planned. William Ritchie, a "leading reclamation farmer" who had begun reclamation farming at Bayou Des Allemands in 1912, was put in charge of the agricultural production of the 1000-acre Churchill Farms tract. Kruse and Ritchie began planning together in August 1923, residing together in a small shack on the tract and directing all operations personally. The bayou from the Company Canal to the property was dredged for an outfall and navigation canal, and the removed soil utilized to construct a banked road-bed from Westwego to the tract (later Lapalco Blvd.). Then the outside levees and canals surrounding the first unit and the inside reservoir system were completed. The inside canals extended over four miles, and were excavated to 27 feet wide and eight feet deep. The main canal was constructed to 50 feet wide and 14 feet wide at its maximum depth. The dredge equipment raised the foundations for the pumping plants and bridges, which were built of concrete. The pumping plant was equipped with a Fairbanks-Morse "semi-diesel" pump and Wood screw pump. The outside canals were designed to be navigable and the outfall stream and other sections were also used for navigation (Figures 4 and 5). The waterways were

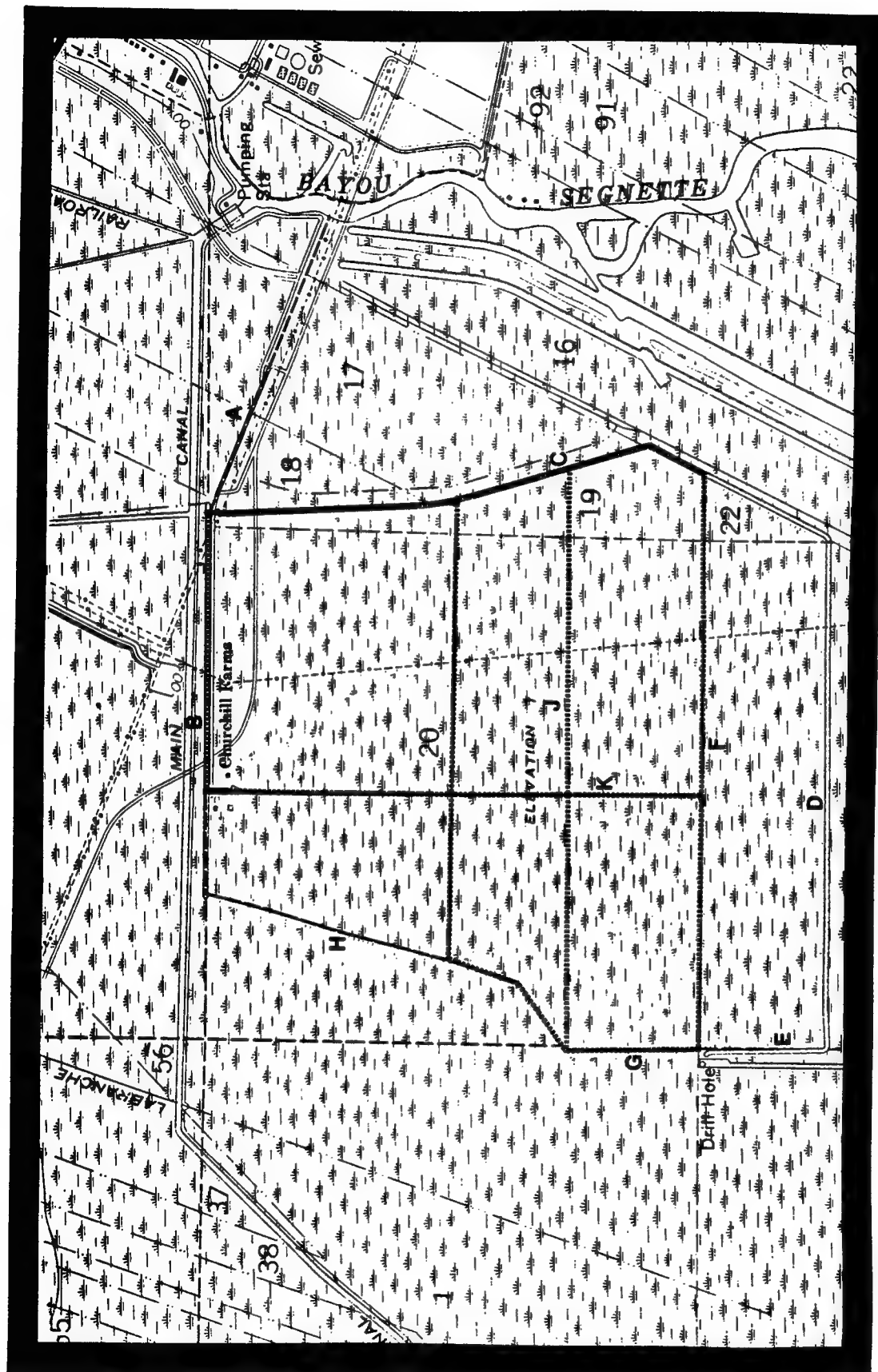


Figure 4. Eddick Reclamation Co. Unit No. 1, "Churchill Farms," Westwego, Louisiana, 1925. Lot and Ditch Plans, plan of navigable and reservoir canals. Redrawn, not to scale. (New Orleans Public Library).

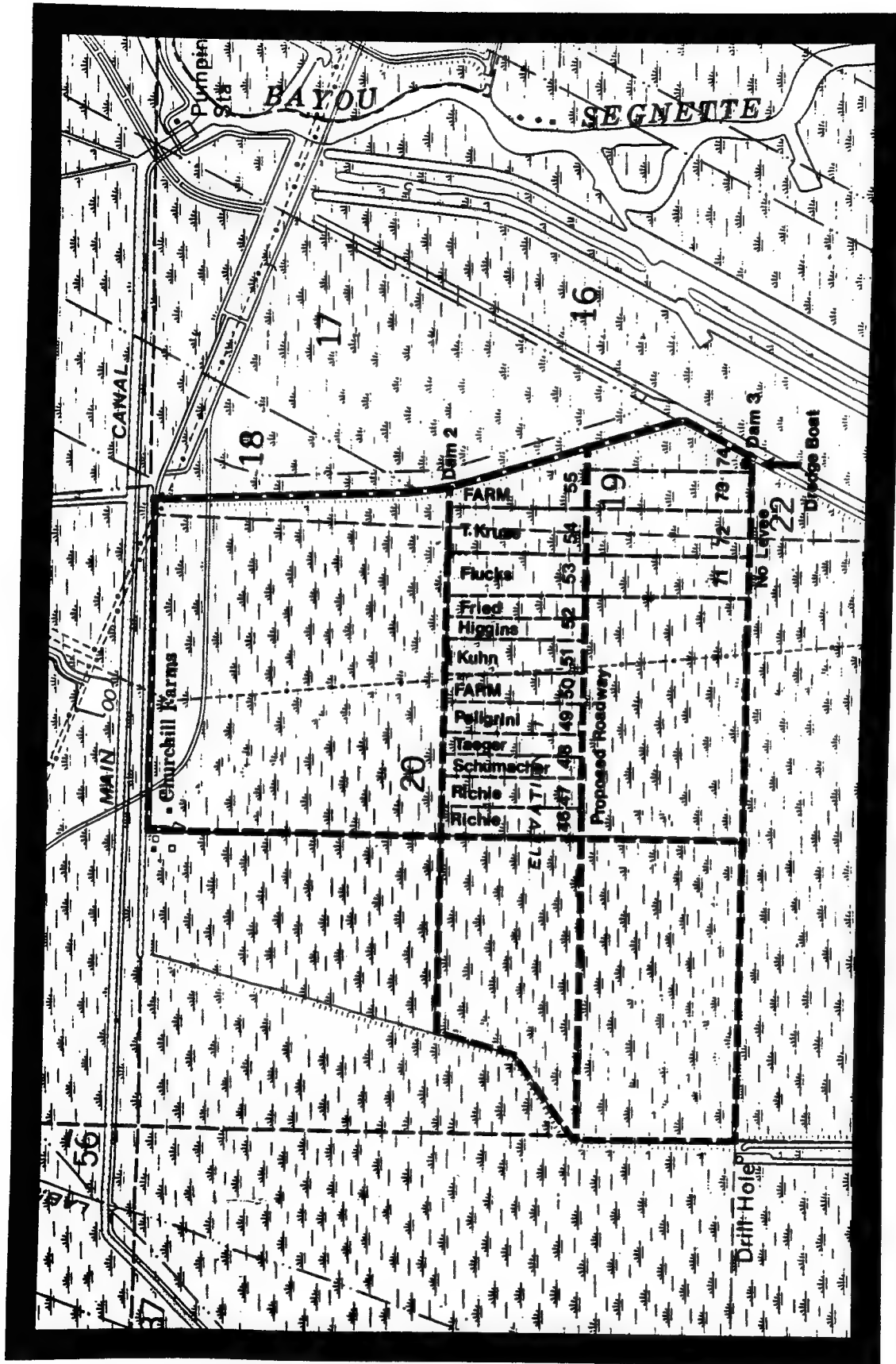


Figure 5. Eddick Reclamation Co. Unit No. 1, "Churchill Farms," Westwego, Louisiana, 1925. Lot and Ditch Plans, plan of lots. Redrawn, not to scale. (New Orleans Public Library).

ultimately connected to the Mississippi River at one end and with the lake and bayou system at the other end. Railroad access was at Westwego, and the Mississippi River bridge was to be built two miles from Churchill Farms. The road to Westwego was to be given a shell roadbed (*Times-Picayune* 1925).

Kruse and Ritchie formulated an elaborate plan for development of agriculture at Churchill Farms. Kruse considered adequate drainage canals and pumping plant to be basic to success in reclamation work. He also planned the reclamation in small units, as was the experience-proven practice in Holland. Dredging of canals would be followed immediately by planting to solidify the levees and banks, inhibit weed proliferation, and shorten the interval before the reclaimed tract could be brought into commercial production. The use of small units allowed water levels to be controlled more carefully for individual crops. Ritchie's "royal rules" were seed selection, constant cultivation, and elimination of waste. He planned to eventually specialize in sweet corn production at Churchill farms, having personally developed the Imperial White variety of corn for Louisiana conditions (*Times-Picayune* 1925). The labor on Churchill Farms was made up largely of African-Americans from Westwego and Waggaman. The project was undertaken with a heavy capital investment in dredging, drainage, and farming equipment. With the exception of some gathering and packing of produce, nearly all operations were mechanized. Only a single pair of horses was on Churchill Farms in 1925 (*Times-Picayune* 1925).

An intensive three-crop rotation plan was introduced by Ritchie, utilizing an overhead irrigation system on the truck farm. The first agricultural produce from Churchill Farms lots was marketed at wholesale in the autumn of 1924. In the following year, produce consisted of potatoes, corn, onions, beets, artichokes, carrots, cabbage, cauliflower, turnips, parsnips, shallots, Swiss chard, and other vegetables. The vegetables were graded and packed at Churchill Farms, and shipped with a Churchill Farms brand on their crates. The produce was conveyed by barge from the Farms to Westwego, where it was loaded onto a railcar and shipped to markets in the southern and northern states. From the start, experiments were undertaken with hay, avocados, orange trees, grapefruit trees, pecan trees, and a tree nursery with ash, cypress, tupelo, dogwood, sweet gum, swamp maple, white and live oaks, magnolia, mulberry, catalpa, sycamore, chinaberry, honey and black locust, acacia, and various evergreens. A floral garden was also planted. Dairy cattle, hogs, and poultry were scheduled to be introduced. In 1925, the New Orleans *Times-Picayune* called Churchill Farms "one of the largest and finest diversified agricultural estates in the country" (*Times-Picayune* 1925).

An existing *Lot and Ditch Plan* of Churchill Farms dated 1925 indicates subdivision and improvement efforts to that date (Figure 4). By this time, Kruse had been joined at Churchill Farms by his son, Theodore Kruse, who served as vice-president and assistant engineer of the corporation. Ritchie had also been joined by his family. Frank R. Ritchie, was superintendent of motors on the Farm. William Ritchie's other son, Harry W. Ritchie, was chief engineer of the drainage plant. They resided in modern homes on the tract. The future looked bright for Churchill Farms. The four inches of subsidence that had occurred on the drained portions of the tract by 1925 (two years after reclamation began) were dismissed as inconsequential (*Times-Picayune* 1925).

Drainage features of the Churchill Farms tract were extensive by early 1927, allowing 200 acres of the nitrogen-rich soil to be utilized for raising corn, potatoes, cabbages, sugar cane, figs, oranges, melons, walnuts, pecans, hogs, evergreen trees, other produce, and cattle, either in small quantities or for market. Produce could be shipped by water or sent by truck a distance of two miles on a Company-built, shell-lined road to the rail lines or dehydrating plant at Westwego (*Times-Picayune* 1927; Gillen 1927). Another article in the New Orleans *Times-Picayune* on September 30, 1927 (Gillen 1927), discussed Churchill Farms at length. Under the inadvertently humorous headline, "Overalls by Day, Evening Dress at Night, is Lot

of Farmers on Churchill Farms," there followed a shamelessly promotional article providing additional detail on the development project. In addition to lots for agricultural purposes, Churchill Farms was accompanied by a planned residential development called Richland Park. Richland Park was envisioned as a "community of country dwellers with city conveniences" just five miles and a half-hour car ride from central New Orleans along Old Spanish Trail (U.S. Highway 90) and over either the Walnut Street ferry or the new Mississippi River Bridge (Huey P. Long Bridge). Water was supplied from a reservoir supplied by an artesian well, and natural gas and telephone service (but not electricity) were among the touted features of the Richland Park development. Kruse was intent on developing Richland Park as well as Churchill Farms, stating "we believe that there are too many subdivisions for investment only... This is a home-builder's proposition, and not just a means of investment. We are providing the conveniences and comforts for homes because homes are what we want" (Gillen 1927).

John A. Kruse advertised widely for Churchill Farms in southern and northern newspapers, and for some years it may have appeared that Churchill Farms was a potential success (Reeves 1996:77). An undated plat in a Jefferson Parish plat book (Plat Book No. 2, Sheet No. 31W) indicates the Eddick Land and Reclamation Company subdivision plan for portions of Sections 19, 20, 21, and 22. It appears that the land below Churchill Farms was to be sold in 10-acre parcels (*Times-Picayune* 1927). At least as late as November 1931, lots with dwelling houses on the Churchill Farms tract were being purchased for development purposes. In July 1932, Richard Churchill concluded an agreement with land contract holders Theodore J. Kruse, William Ritchie, William Flucks, and Mrs. Mabel M. Hinton to maintain levees, canals, and ditches on the Churchill Farms tract. Another land contract holder, Karl Fried, was not a party to this agreement. Map and photographic evidence indicate several buildings and other development on the Churchill Farms tract. The 1932 edition of the New Orleans West quad shows roadways dividing the Churchill Farms tract, with at least 13 structures depicted (Figure 6). The majority of these structures were located along an east/west road bisecting Section 20. In less than twenty years, Churchill Farms was essentially abandoned. On the 1951 USGS quad, the east-west bisecting Section 20 was not depicted, and only a single structure was visible in the interior of the Churchill Farms tract, at the approximate center of Section 20. The 1951 and 1965 quads show a large area of the Churchill Farms tract noted as having a one foot elevation, still higher than the surrounding area. It also shows portions of the north/south and east/west canals bisecting section 20. The 1965 (photorevised 1972) New Orleans West quad map indicates a canal or ditch system cutting the Churchill Farms tract into five areas. However, these canals parallel the routes of the roads depicted on the 1932 quad and are likely drainage features associated with the older roadways.

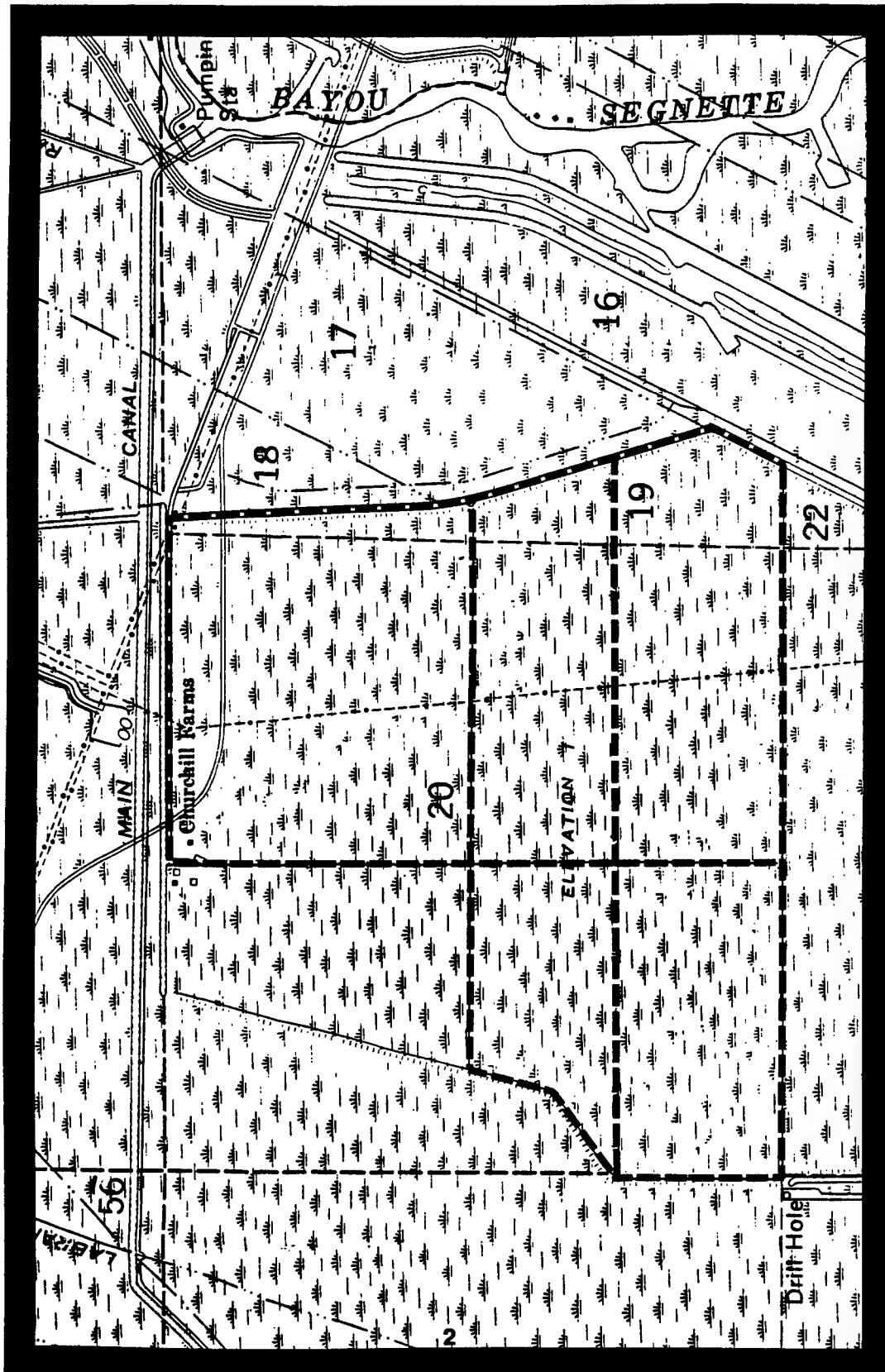


Figure 6. Excerpt from the 1979 USGS *New Orleans West 7.5"* quadrangle map showing the Churchill Farms Tract. Improvements indicated on the 1932 *New Orleans West* quad have been redrawn on to this quad because of poor duplication quality of the 1932 quad.

CHAPTER 5 PREVIOUS ARCHEOLOGICAL INVESTIGATIONS IN THE LAKE CATAOUCHE REGION

Introduction

This chapter summarizes the research results of investigations of the Lake Cataouatche region. No sites previously have been reported in the current project area. Only one site, Bayou Gaudin (16JE133), has been recorded within the marshland northeast of Lake Cataouatche (east of Bayou Verret and west of Bayou Segnette) which the project area traverses. This review examines the archeological sites and projects within the drainages of Bayous Verret, Gaudin, Segnette, and Bardeaux, and along the shoreline of Lake Cataouatche. This chapter also discusses sites and projects along the Mississippi River bankline adjacent to the headwaters of Bayous Gaudin and Segnette.

Most of the identified archeological sites in the Lake Cataouatche region have been recorded during archeological surveys. Very little excavation data exists for most of these sites. The Pump Canal site (16SC27) is the only extensively excavated site in the region. The stratigraphic information from the Pump Canal site, in conjunction with additional archeological data from the Bayou des Familles/Bayou Barataria region to the east provides the best guide to the area's prehistory.

Beavers (1978)

This report details a pedestrian survey of the proposed Marion Corporation oil well site location. During the permit application process for dredging of an access canal, an objection was filed due to the proximity of the Bayou Gaudin site (16JE133) to the proposed construction. The construction area was surveyed. No cultural resources were observed in the well location or in the area to be dredged. The Bayou Gaudin site was outside the area to be impacted by construction. It was decided that planned construction would not impact significant archeological resources. No further work was recommended, except on the chance that archeological remains were uncovered during dredging and construction. No description is given of the archeological deposits at the Bayou Gaudin site.

Gagliano et al. (1979)

Coastal Environments, Inc. (CEI), conducted archeological research in the eastern portion of the Lake Cataouatche region and in the adjacent Bayou des Familles/Bayou Barataria region. This work entailed the intensive archeological survey of the bankline and dredge spoil disposal areas along portions of the Bayou Segnette, Barataria, and Rigaud waterways (Gagliano et al. 1979:1/1). Survey crews utilized small boats to inspect banklines and spoil disposal areas. Systematic surface collections were made at identified sites.

One site was recorded with the Lake Cataouatche region: East of Bayou Bardeaux (16JE82). This site is described as a *Rangia* shell midden on a subsided natural levee. In 1977, a 10 cm (3.9 in) thick lens of shell was observed at the water line, but the site had been built over for use as a modern fishing camp. A bulkhead had been constructed across the site along the eastern bankline of the Bayou Segnette Waterway. The camp is now within the Jean Lafitte National Historical Park Barataria Unit core area. A site update prepared in 1992 by James Wojtala of the U.S. Army Corps of Engineers suggests that the surviving portion of the site is protected by the bankline bulkhead. No artifacts were observed at the site.

The site is on the south bank of a small unnamed tributary of Bayou Bardeaux, and on the east bank of the Bayou Segnette Waterway. Most of the site probably was destroyed when

the waterway was excavated. The waterway is a modern canal between Bayou Segnette and the Intracoastal Waterway. Bayou Segnette itself is a tributary of Bayou Bardeaux, entering it near the eastern end of Lake Cataouatche. Due to the retreat of the lakeshore within the historic period, Bayou Bardeaux and Bayou Couba farther west are now broad interlacustrine channels between Lake Salvador and Lake Cataouatche.

Beavers et al. (1980)

Beavers, Kelley, and Lamb prepared an archeological review and assessment for a projected highway on the West Bank of Jefferson Parish. This research entailed the documentation of sites to the Lake Cataouatche shoreline. Two additional sites were recorded in the Lake Cataouatche region.

The Isle de Puet site (16JE81) is on the east bank of Bayou Bardeaux, about 300 m (984.24') north of its entrance into Lake Salvador. The site is 900 m (2952.72') southwest of 16JE82. The site is described as measuring 48.77 m x 18.29 m (160' x 60'), with *in situ* midden and a possible mound area on the natural levee deposit. Spoil bank is also present here. Plaquemine sherds (Leland, *var. Leland*) were collected on the surface in 1979. The site is now within the Jean Lafitte National Historic Park Barataria core area.

The Isle de Puet site is 500 m (1640.4'), north of the northern end of the Bayou Bardeaux site (16JE46). The latter site is an extensive shoreline scatter (1.5 km [0.93 mi] north/south) along the east shore of Lake Salvador. The center of 16JE46 may lie on a subsided natural levee of a Bayou des Familles distributary, perhaps the lower course of Bayou Coquille. The distributary would have entered Lake Salvador south of Bayou Bardeaux. Shell and artifacts may have been redeposited northward along the retreating lakeshore as far as the former course of Bayou Bardeaux, but site 16JE46 is only tenuously linked with that watercourse.

The Bayou Gaudin site (16JE133) is at the northern end of a wellhead canal which extends 400 m (1312.32') north from the northeast shore of Lake Cataouatche. The mouth of the canal is 1 km (0.62 mi) east of the mouth of Bayou Gaudin. The end of the wellhead canal is separated from the south bank of the Outer Cataouatche Canal by a narrow strip of marsh. Stone rip-rap has been placed along part of this bankline to block formation of an outlet channel to the lake through the wellhead canal. Two NW/SE pipelines cross the north end of the wellhead canal. The site is partially covered by spoil along a western arm of the wellhead canal, but extends westward beyond the spoilbank. The site was described as measuring 12.19 m x 45.72 m (40' x 150'), with an intact shell midden (LA site files). The period of occupation and cultural affiliation of the site are unknown. Michael Comardelle (personal communication to Jones 1997) states that prehistoric sherds and human remains are present on the ground surface. The site was not visited during the current investigations.

The Bayou Gaudin site is the previously recorded site nearest the current project area. However, the location of the site has not been precisely plotted. It lies within the SW quarter of Section 10 in T14S, R22E, and/or within the adjacent undivided portion of T14S, R22E to the south. It should be noted that the area south of Section 10 is in the Jean Lafitte National Historic Park, Barataria Unit, park protection zone, and an assessment of sites within the Barataria Unit, includes the site within the park (Speaker et al. 1986:70).

Greene et al. (1983)

An inventory of cultural resources along the Mississippi River's banklines included the Seven Oaks Plantation site (16JE139). This is the only recorded archeological site within the city of Westwego. The plantation faced the River Road (Highway 541), and Old Spanish Trail

(Highway 18) runs east/west across the base of the point south of the plantation great house. The building complex area was estimated as 30.48 m x 30.48 m (100' x 100'). Seven Oaks was a sugar cane and rice plantation in the nineteenth and early-twentieth centuries. The site has been heavily disturbed by the construction of a modern tank farm (oil storage facility).

Shafer et al. (1984)

Shafer et al. conducted an archeological survey of the Bridge City levee in 1984. They recorded Avondale Plantation just upriver from the Avondale shipyard. Testing revealed late-nineteenth-century material in an area measuring 20.15 m x 11.89 m (66' x 39'). The artifacts are associated with structural remains on the historic Avondale Plantation.

Goodwin et al. (1985)

This site inventory of Jefferson Parish entailed an updated listing of previously recorded archeological sites and the field survey of impact of development corridors. A probability sampling strategy was employed to assess the impact corridors, utilizing square kilometer quadrants keyed to UTM grid coordinates. Only one of the randomly chosen survey blocks lies along the West Bank Hurricane Protection Levee, Lake Cataouatche segment. This block was one of two survey blocks judged to be "inaccessible to pedestrian survey," and no fieldwork was conducted there (Goodwin et al. 1985, vol. 1:225, 227). The block lies south of the Churchill Farms reclamation tract.

This overview also lists several historic West Bank sites which had not been entered in the state site files at that date. These sites included the Cedar Grove Plantation Great House in Avondale, the Huey P. Long Bridge in Bridge City, Magnolia Lane Plantation and Derbigny Plantation on Nine Mile Point, and Seven Oaks Plantation in Westwego (Goodwin et al. 1985, vol. 1:280; 1985, vol. 3:164, 166). Only Magnolia Lane Plantation (16JE156) and Seven Oaks Plantation (16JE131) have been assigned state site numbers. The study recommended that the Huey P. Long Bridge is eligible for inclusion on the National Register of Historic Places, and that the Nine Mile Point area (from the northern end of the point downriver to the former alignment of the Company Canal in Westwego) be nominated to the NRHP as an archeological and historic district (Goodwin et al. 1985, vol. 1:208, 279-282).

Goodwin et al. (1986)

This survey by Goodwin and Associates examined construction items on the West Bank of Jefferson Parish, from Waggaman downriver to Gretna. A nineteenth-century great house and cabins survive at the Magnolia Lane Plantation site on Nine Mile Point. Archeological testing at this locale exposed late-nineteenth- to mid-twentieth century artifacts to a depth of 30 cm (11.81 in). Shovel tests, a 1 x 2 m (3.28' x 6.56') unit, and a 2 x 2 m (6.56' x 6.56') unit were excavated at the site. The site area measures 70 m x 40 m (229.66' x 131.23').

Speaker et al. (1986)

This study presents an overview of archeological sites within the Jean Lafitte National Park, Barataria Unit, for planning purposes. It provides UTM coordinates for recorded sites and lists impacts to the sites. The bankline of Bayou Bardeaux and the northeastern shoreline of Lake Cataouatche (the lakeshore within Jefferson Parish) were identified as areas of potential archeological resources (Speaker et al. 1986:83). Sites 16JE81 and 16JE82 have been recorded along the east bank of Bayou Bardeaux and on one of its side channels. As no archeological sites have been reported along Bayou Segnette, that waterway is not listed among the zones of archeological sensitivity.

The study also identifies an area of potential archeological resources within the park protection zone in the Bayou Boeuf watershed, west of Bayou des Familles. Bayou Boeuf originates near a western bend in the course of Bayou des Familles near the community of Estelle, and may represent the lower course of a former distributary of that bayou. Bayou Boeuf flows westward into an eastern bend of Bayou Segnette. The Bayou Segnette Waterway cuts across the base of this bend. The area delineated in the 1986 assessment is largely wooded terrain that was partially drained and planted during the nineteenth century. Most of this zone lies east of a levee erected by the parish.

The study lists the Pecan Grove Water Wheel (near the junction of the Estelle Canal and Woods Place Canal, on the Pecan Grove Plantation) as an archeological site. This nineteenth-century drainage feature has not been recorded archeologically (Speaker et al. 1986:66, 71, 83).

Jones et al. (1994)

This study examined portions of St. Charles Parish impacted by the Davis Pond Freshwater Diversion project. The project will divert water from the Mississippi River east of Luling and channel it through the marshland west of Bayou Verret to the northwestern end of Lake Cataouatche. The portions of the project area south of the Southern Pacific Railroad include the marshlands near the lake. A small part of the Davis Pond project area lies on the West Bank of the river north of the Southern Pacific Railroad. This area has less significant ties to the lacustrine marsh environment and will not be included in this discussion of the Cataouatche region. The project area extends west to the vicinity of the Mimosa Park subdivision south of U.S. Highway 90. This vicinity is the head of the Bayou Cypriere Longue and Bayou Bois Piquant drainages. Prior to the excavation of drainage and navigation canals in this region, these bayous were the westernmost tributaries of Lake Cataouatche. The swamp and marsh farther west drain to Bayou des Allemands or the northern side of Lake Salvador. The Davis Pond study entailed pedestrian survey with shovel testing within construction corridors at the northern end and along the western margin of the diversion area, auger testing along the westbank of Bayou Verret and by canals along the northern and southern boundaries of the project area, and excavation at the Pump Canal site.

One historic plantation canal (the Lanaux Canal) intersects the north side of the lakeshore within the Davis Pond project area. An east/west swamp forest access canal, the Louisiana Cypress Lumber Canal, intersects the west side of the lakeshore. That turn of the century waterway allowed exploitation of the cypress forests west of the lake.

The present western shoreline of Lake Cataouatche has retreated rapidly during the twentieth century. An agricultural reclamation project in the marshland west of the lake, the Winter Garden or New Orleans Netherlands Farms, failed after damage from the great hurricane of 1915. The waters of the lake now cover the drained and subsided field plots. The Pump Canal site lies within the flooded farm tract. No historic sites were recorded within the Lake Cataouatche region of the project area, although an extensive network of early drainage and navigation canals survives here.

One small prehistoric site (16SC76) was recorded between the channels of Bayou Cypriere Longue and Bayou Bois Piquant, within the Salvador State Wildlife Management area. The site is along a jeep trail near the confluence of the two bayous, on the natural levee of Bayou Bois Piquant, a relict distributary channel. *Rangia* fragments were recovered on the ground surface and to a depth of 20 cm (7.87 in) in test units. Shell was recovered in four 50 x 50 cm (19.69 x 19.69 in) excavation units. A single *Rangia* shell was recovered in an auger test placed between the site and the bayou confluence. A single small, highly eroded sherd of Baytown Plain, var. *Unspecified*, was found in one of the 50 x 50 cm (19.69 x 19.69 in) units

at 20-30 cm (7.87-11.81 in) depth. The site was recommended as being ineligible for nomination to the NRHP (Jones et al. 1994:243).

The Pump Canal site is the most extensively researched prehistoric site in the Cataouatche region, and one of the most significant sites for our understanding of prehistoric subsistence patterns in the Barataria Basin. The stratified deposits are associated with the Troyville, Coles Creek, and Plaquemine cultures. A small amount of historic material, largely dating to the nineteenth century, was recovered from the uppermost strata of the site. Post-molds, hearths, and ash lenses were exposed within the prehistoric strata. Faunal analysis indicates that fish and wetland species constituted the majority of vertebrate food species during all prehistoric periods. Although the site is not classified as a shell midden, large amounts of *Rangia* shells are present at the site. Small quantities of corn appear in the Incipient Coles Creek period. Squash begins to appear in the Plaquemine period. Possible cultigens including *Vitis* spp., and *Chenopodium* also were recovered. The site provides significant data on the food resources and dietary changes.

A portion of the Pump Canal site lies below a spoil bank deposit on the north bank of an east/west drainage canal excavated for marshland reclamation. Due to the flooding of the abandoned farm tract, the spoil deposit above the site now forms an island within Lake Cataouatche. In 1991-1992, the dimensions of the site island were 33 m x 9 m (108.27' x 29.53') (Jones et al. 1994:248). The extent of the site below lake level is uncertain. As a result of continued erosion by wave action on the lake, the island undoubtedly will diminish in size and probably disappear with time.

Estelle Canal site (16JE41)

In 1995, the Estelle Canal site (16JE41) was recorded by James Wojtala and Michael Stout. It is a prehistoric site with intact midden in the Bayou Boeuf drainage east of Bayou Segnette. The site lies west of the modern West Bank Hurricane Protection Levee but inside (east of) the older parish levee, within the Jean Lafitte Nation Historical Park, Barataria Unit, part protection zone. This area was previously identified as an archeologically sensitive zone with potential archeological resources (Speaker et al. 1986:66, 83). The site is located between the Estelle Canal and the Woods Place Canal, on a tongue of higher ground extending westward from Bayou des Familles. The site is bisected by an abandoned field ditch which was probably a feature associated with the Pecan Grove Plantation. The Estelle Canal site has a surface scatter of *Rangia* and prehistoric sherds in several discrete concentrations measuring 25 m x 70 m (82.02' x 229.66'). Shell was found to a depth of 34 cm (13.39 in) in a positive shovel test. The site appears to be relatively undisturbed and offers research potential.

CHAPTER 6

ARCHEOLOGICAL SURVEY OF THE PROJECT IMPACT AREAS

Introduction

Archeological fieldwork consisted of pedestrian survey within a linear borrow right-of-way, an adjacent floodwall borrow area, and a reforestation mitigation tract. Survey transects were spaced 20 m (65.62') apart, with shovel tests excavated every 50 m (164.04'). The shovel test positions on adjacent lanes were offset by 25 m (82.02') to provide more complete coverage of the survey area. Within the linear borrow right-of-way, the survey corridor varied in width from 35.1 m (115') to 48.8 m (160'), measured from the northern bankline of the canal. The field crew excavated shovel tests along two transect lanes where the corridor width was less than 40 m (131.23') and along three transect lanes where the corridor width was more than 40 m (131.23'). The crew also conducted a visual inspection of the canal bank where it presented an exposed slope. Shovel tests measured 30 cm (11.8") in diameter and were excavated to a depth of 50 cm (19.69") or to sterile subsoil. Excavated soils were screened through 1/4 inch mesh whenever soil consistency permitted. Very clayey soils were carefully trowel-sorted and examined for cultural remains. Field investigations began on February 13 and terminated on February 27, 1997.

Survey Area West of the Pumping Station

The western portion of the project area comprises the borrow right-of-way between Levee Station 156+00 and Cataouatche Pumping Station No. 1. The western end of the survey area is at the intersection of the Inner Cataouatche Canal with a smaller north-east/southwest trending drainage canal. Northwest of the drainage canal is a sanitary landfill (Area Ninety Landfill, Inc., 5301 Highway 90) extending to U.S. Highway 90. The borrow right-of-way begins at the southeastern bank of the drainage canal. The eastern end of this segment of the survey area is at the fenced enclosure around Pumping Station No. 1 (Levee Station 306+53). This portion of the borrow right-of-way is largely open pasture, with small wooded areas by stream bottoms and well-head canals. A number of drainage canals running northeast to southwest enter the Inner Cataouatche Canal through steel culverts.

Transecting began at the western end survey segment (Levee Station 156+00) and extended eastward. The top of the canal bank here was about two meters (6.56') above the standing water in the canal at the time of survey. The canal bank is visibly higher than the pastureland north of it from the western end of the borrow right-of-way to the Bayou Gaudin channel, near the pumping station. This slight elevation (less than 0.5 m [1.64']) presumably was created by the placement of some spoil from the canal bed on the interior or northern side of the canal as well as on the levee side. The strip of elevated terrain is generally 20-30 m (65.62'-98.42') wide. Some linear banks of bull-dozed earth, probably produced during land clearance, follow the interior side of the higher ground. The width of the borrow right-of-way in this area varies between 35.1 m (115') and 45.7 m (150'). The canal bank was examined for artifacts or cultural features along this entire segment, excepting bank areas covered by matting.

From E0 to E575, three parallel transects were surveyed. A northeast/southwest well-head canal crosses the corridor at ca. E555. East of this feature, the corridor narrows from 42.7 m (140') to 39.6 m (130'), then to 38.1 m (125') and 36.6 m (120'). Two transects were run in this area.

A slight scatter of degraded *Rangia* shell was observed on the surface of the canal bank between E1695 and E1745. One fish bone, the basio-occipital of an unidentified species, was noted at E1720. This faunal material appears old, but no cultural material was recovered, nor

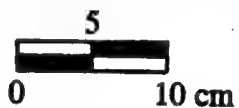
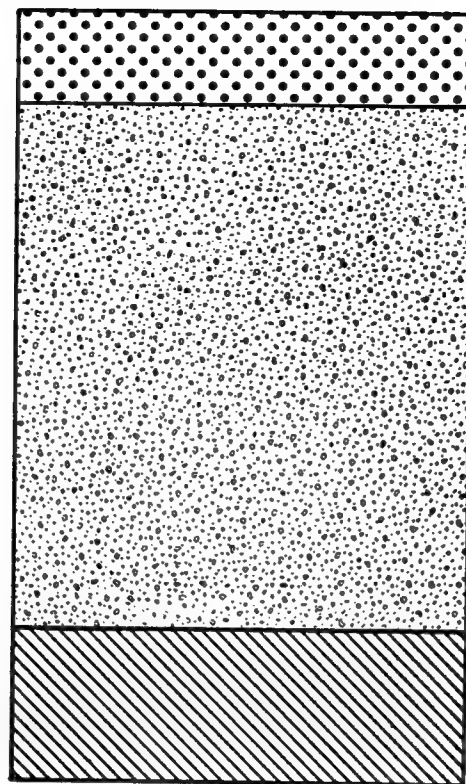
was any recognizable midden observed at this locale. This locale therefore was not identified as an archeological occurrence. Britsch (1996:7-8) does not record any distributaries in this locale, which is between Bayou Verret and an unnamed distributary which drains into the lower course of Bayou Verret. However, Plate 4 of the project blue line aerials apparently shows channel-like soil patterns trending WNW/ESE from the vicinity of the faunal locality to a western bend in the unnamed distributary, suggesting an unrecognized branch of the distributary in this area. The most detailed geological review of the area records several near-surface natural levee deposits in Boring LCL 7 (Sta. 208 + 50) at this locale (U.S. Army Corps of Engineers 1996:Plates F-10 and F-16).

Most shovel tests between E0 and E500 revealed mixed silt and clay (probably canal bed spoil) to a depth of ca. 30 cm. A stratum of peaty silt (representing organic-rich marsh deposit) continued to an average depth of 40 cm. Stiff clay continued below the peaty silt to a depth of 50+ cm. Shovel tests between E600 and E1500 generally revealed mottled clay or mixed silt and clay to an average depth of 10-20 cm, with stiff clay below. Shovel tests between E1500 and E1800 and between E2000 and E2075 revealed small amounts of sand and silt, perhaps reflecting natural levee deposits in this vicinity. Shovel test A2 E1725 revealed mixed silt and clay at 0-6 cm, clayey silt at 6-40 cm, and stiff clay at 40-50 cm (Figure 7). Numerous fragments of cypress trees were observed on the canal bank from E0 to E2000; far fewer are present farther east.

A drainage canal running northeast to southwest (Lateral Canal No.1) intersects the Inner Cataouatche Canal at E2170-2180. In this vicinity, the borrow right-of-way is 38.1 m (125') wide. The corridor narrows to 35.1 m (115') at Levee Station 233+63.41, about E2420. From E2350 to E2850, stiff clay was exposed in shovel tests from the surface, or within 10 cm of the surface, to a depth of 50+ cm. Between E2790 and E3160, the sloping canal bank has been covered with plastic mesh to stabilize the bankline. This mesh is weighted with crushed stone at the water's edge. Some crushed stone is scattered on the surface parallel to this bankline material. An east/west well-head canal intersects the canal bank at E3185-3195. The unnamed distributary mentioned above formerly entered Bayou Verret in this vicinity, crossing the canal bank at ca. E2850-2900. At Levee Station 246+42.13 (ca. E2850), the corridor widens to 44.2 m (145'). Three parallel transect lanes were resumed eastward from this point.

The corridor widens to 45.7 m (150') and then narrows to 44.2 m (145') between the former courses of the unnamed distributary and Bayou Gaudin. The terrain between these channels is densely wooded near the Inner Cataouatche Canal. Bayou Gaudin drains into the canal through a culvert at E4040. An embankment has been constructed across the bayou where it intersects the south bank of the Outer Cataouatche Canal to prevent the formation of an open channel between the canal and the lake. From E3350 to E4100, shovel tests typically revealed 10-20 cm of stiff clay or mottled clay above peaty silt (marsh soil). In some shovel tests, the underlying stiff clay was encountered at 40+ cm depth. At E3750, a 2.5YR 4/8 (red) burnt clay was encountered at 42-50+ cm. Buried burnt clay also was found at A1 E3700 and A3 E3900. This widespread burnt surface was not interpreted as a cultural feature and is probably the result of a fire.

East of the Bayou Gaudin channel, the borrow right-of-way narrows to 41.1 m (135'), then widens to 42.7 m (140') nearer Cataouatche Pumping Station No. 1. Recently deposited spoil from the canal bed has been placed on top of the sloping canal bank from E4320 to the station. Transect lanes were reduced from three to two from E4050 to the pumping station. Clayey silt or silty clay was encountered generally at 10-45 cm, with peaty silt below, in shovel tests E4350-E4750. At E4820, transects terminated by the chain link fence parallel to two 60" discharge pipes crossing the Inner Cataouatche Canal. The delineated borrow right-






-  10 YR 3/1 (very dark gray) mixed silt and clay
-  2.5 Y 5/4 (light olive brown) clayey silt
-  10 YR 4/1 (dark gray) stiff clay

Figure 7. Profile of shovel test A2 E1725.

of-way extends through the pumping station complex, but no excavations were undertaken within the enclosed area.

Survey Area East of the Pumping Station

The eastern portion of the project area consists of the borrow right-of-way between Cataouatche Pumping Station No. 1 and Levee Station 506+30.74 and an adjacent floodwall borrow area. The western end of this corridor segment follows the east bank of the discharge channel from the Main Canal to the Inner Cataouatche Canal, roughly at the limit of sheet piling by the pumping station at Levee Station 310+31.09. The eastern end of this corridor segment is within Bayou Segnette State Park, about 152.4 m (500') southwest of an overhead power line traversing the park.

This portion of the borrow right-of-way is mixed woods and marshland. Two historic drainage canals, the Waggaman (or Avondale Outflow) Canal and the Labranch Canal run northeast to southwest across the project alignment, terminating at Lake Cataouatche. Two modern north/south well-head canals also cross the right-of-way at E2500 and E4200. The dense woodland between these canals is ungrazed, since an east/west canal (Canal No. 3) intersects the well-head canals north of the levee, creating a virtual island. The well-head canals are depicted as wide waterways on current quad maps of the area, but actually are largely dry and crossable by foot. Distance along the transects was measured eastward from the pumping station.

The terrain between the Main Canal and the well-head access canal at E2500 is relatively open woodland with small inundated areas. Cattle graze this area. A vehicle track follows the top of the canal bank from Cataouatche Pumping Station No. 1 to the western bank of the well-head canal, and then turns northward. The top of the canal bank is slightly higher than the woodland north of it in most of this segment. The slightly higher elevation (less than 0.5 m [1.64']) probably was created by placement of canal bed spoil on the north side of the canal. The raised ground forms a strip 20-30 m (65.62'-98.42') wide near the pumping station, but is less recognizable eastward.

Three parallel transects were surveyed from the pumping station (Levee Station 310+31.09) eastward to the well-head canal at E2500. The borrow right-of-way is 45.7 m (150') wide, narrowing to 44.2 m (145') near the well-head canal. A Shell Oil Co. 8-inch steel crude pipeline crosses the right-of-way at E125. The Waggaman Canal runs northeast to southwest across the right-of-way at E790 via a steel drainage pipe. Shovel tests from E100 to E350 exposed loose silty peat to 50+ cm. Between E400 and E750, the upper stratum graded from an organic-rich silt to a clayey silt, and the top of the underlying stiff clay was encountered at a decreasing depth from 45 to 25 cm. The deep silty peat zone lies between shallow subsurface natural levee deposits detected in Borings LC-3U (Sta. 295+50) and LCL-5 (Sta. 324+50); the latter boring is opposite E433 transect position. The natural ground surface below the protection levee slopes down from LC-3U to LCL-5 and rises slightly from LCL-5 to Boring LCL-9 (Sta. 374+20), opposite the E1947 transect position (U.S. Army Corps of Engineers 1996:Fig. 17). The upward slope eastward may explain the thinner stratum of peaty silt in that direction.

The woodland east of the Waggaman Canal for about 300 m (984.24') (ca. E790-1090) consists of much smaller trees, suggesting growth in recently abandoned pasture. Areas of burnt clay on the ground surface here suggest the burning of brush or timber, perhaps in bulldozed brush piles during forest clearing. Shovel tests E800-1050 yielded 30-35 cm of a 2.5YR 4/8 (red) burnt clay above stiff clay. Shovel tests E1200-1500 yielded 30-35 cm of silt with a high organic content above stiff clay. At about E1400, an 8 m (26.25') wide north/south clear-cut intersects the borrow right-of-way. The clear-cut bends and follows a

NNE/SSW alignment approximately at the northern (interior) edge of the borrow right-of-way. This alignment would intersect the longer well-head access canal at a bend in its course. No markers or warning signs were observed along the clear-cut.

Shovel tests E1550-1700 exposed clayey silt to a depth of 40-45 cm, with stiff clay below. Shovel tests E1750-2050 revealed silt or peaty silt to a depth of 27-40 cm, with stiff clay below. A dark organic rich silt was present at E1750 at 0-30 cm depth and at E1800 at 25-40 cm depth (Figure 8). This stratum is distinctive from the humus-like peaty silt found along much of the project corridor. Tests at E2100-2150 showed peaty silt "humus" to 50 cm. Borings LCL-9 (Sta. 374+20 - opposite E1947) and LCL-4 (Sta. 382+50 - opposite E2200) revealed only swamp clay deposits in this vicinity (U.S. Army Corps of Engineers 1996). Shovel tests E2250-2450 exposed clayey silt to a depth of 3-23 cm, with stiff clay below.

The western side of a north/south well-head access canal is located at E2500. A narrow stream flows into the Inner Cataouatche Canal along this side of the canal bed. The well-head canal is approximately 45.7 m (150') wide, but the eastern side is not easily recognizable. The end of the canal within the borrow right-of-way is largely filled with spoil. At the well-head canal crossed at E2500-2550, the borrow right-of-way widens to 45.7 m (150'). It widens again to 47.2 m (155') and 48.8 m (160') farther east.

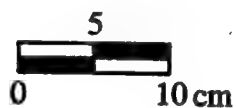
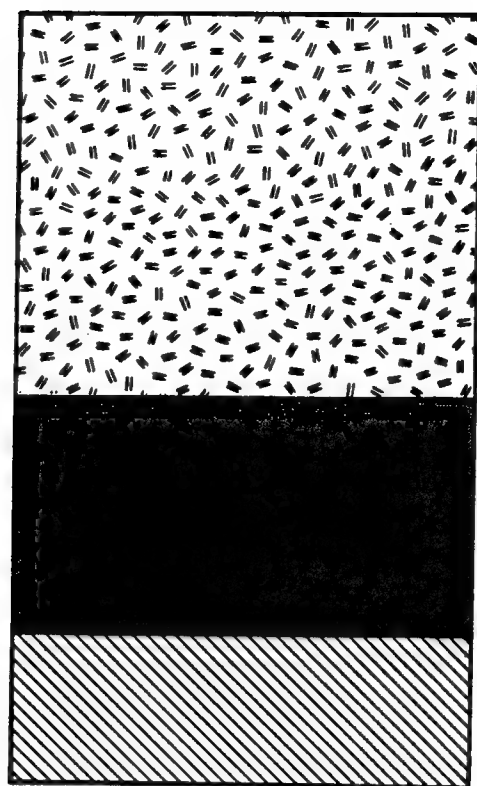
Shovel tests E2600-2750 revealed clayey silt to a depth of 10-30 cm, with stiff clay below. Shovel tests at E2800 showed two cm of silt above stiff clay. One of two unnamed distributary channels flowed from a south-trending arm of natural levee deposit towards Lake Cataouatche in this vicinity (Britsch 1996:13).

From E2850 eastward to about E4975, the edge of the canal is 10-20 m (32.80-65.62') south of a clearly defined bankline cut. Short ridge-and-swale scar patterns are visible on parts of the low bank, running diagonally to the canal alignment. These features are reminiscent of pullboat scars. A number of large trees and decayed stumps are present on top of the high canal bank, suggestive of an older land surface. Nonetheless, the higher canal bank cut noted along the northern (interior) side of the Inner Cataouatche Canal probably is an artifact of the excavation process. The natural ground surface apparently was cut back 10-20 m (32.80-65.62') from the edge of the canal bank along this portion of the borrow right-of-way.

Shovel tests E2850-3200 showed clayey silt or silt with pockets of clay to 50 cm. The route of the historic Labranche Canal crosses the borrow right-of-way near E3200, but the canal could not be identified on the ground. Boring LC-2U (Sta. 412+50) revealed silt strata in this locale, associated with an unnamed distributary flowing south to Lake Cataouatche (Britsch 1996:8, 13). Shovel tests E3600-3650 exposed humus-like peaty silt to a depth of 15-25 cm, with stiff clay below. The only stand of cypress trees observed along the project alignment is located at E3650-3700, 10-50 m (32.80-164.04') north of the high canal bank. The southern half of this bald cypress grove lies within the borrow right-of-way.

Shovel tests E3700-E3750 exposed silty clay or peaty silt to 50 cm. Shovel tests E3800-4000 generally showed peaty silt above stiff clay. Peaty silt with a 2.5YR 4/8 (red) burnt clay was present at E3850-3950 and E3875-4025, above a stratum of stiff clay. This burnt clay was probably the result of a fire in the area. At Levee Station 432+08.01, approximately opposite E4000, the corridor narrows to 36.6 m (120'). Shovel tests E4050-4750 generally revealed peaty silt to a depth of 20-50+ cm, with stiff clay below.

A north/south well-head canal crosses the right-of-way at E4150-4200. High spoil banks line both sides of the channel. The canal bed is largely dry, but a shallow stream flows above a bed of stiff clay south into the Inner Cataouatche Canal at E4175-4177. At E4210, a






-  10 YR 2/2 (very dark brown) peaty silt
-  10 YR 2/1 (black) organics-rich silt
-  10 YR 4/1 (dark gray) stiff clay

Figure 8. Profile of shovel test T.1 E1800.

modern barbed wire fence runs north/south. The fence follows the boundary between R22E Section 12 and R23E Section 21. Cattle graze the land east of the fence. East of about E4800, open marshland extends north from the project corridor. The water table is quite shallow in this area. The borrow right-of-way in this segment is less than one meter above the water level in the canal.

Shovel tests E4800-5200 revealed peaty silt above stiff clay. The top of the stiff clay was encountered at 45 cm depth at E4750. This clay generally is found at shallower depths eastward, and at only 15 cm at E5200. The corridor crosses a slightly elevated "island" with larger trees at E5320-5350. Stiff clay extended from the surface to 50 cm at E5350. Boring LC-6 (Sta. 473+50) opposite this higher ground revealed a near-surface deposit of silt within a swamp environment (U.S. Army Corps of Engineers 1996:Plates F-10 and F-18). The Bridgeline Pipeline Company's northeast/southwest 24-inch steel crude oil pipeline crosses the borrow right-of-way at E5370-5385. In this vicinity, the borrow right-of-way widens to 41.1 m (135'), then narrows to 38.1 m (125'), where the levee and canals curve northward.

Shovel tests E5450-6150 revealed peaty silt to a depth of 10-35 cm. Plastic clay underlies the peaty silt at E5450-5750. At E6100, a chain link fence running northwest/southeast along the Section 16/21 boundary marks the boundary of Bayou Segnette State Park. The survey corridor ends at E6170 (Levee Station 506+30.74).

A borrow right-of-way 15.2 m (50') wide continues to Levee Station 516+00, a distance of 295.3 m (969'). The exterior side of this narrow strip jogs 6.1 m (20') towards the levee from the eastern end of the wider borrow right-of-way. The narrow borrow extension should impact only the inundated northwest (interior) bankline of the Inner Cataouatche Canal and accumulated canal fill along this bankside. The terrain is generally inundated, and modern refuse litters the ground surface near the embankment at the overhead power line crossing.

Floodwall Borrow Area

The 15 acre floodwall borrow area is adjacent to the linear borrow right-of-way and the state park. The long axis of this trapezoidal borrow area is parallel to the adjacent linear corridor, which is here 38.1 m (125') wide. The northeastern side of the parcel is parallel to the fence line at the state park boundary, 30.5 m (100') southwest of that line. The floodwall borrow area is 213.3 m (700') wide along its southwestern side. The southeastern side is about 189 m (620') long adjacent to the linear borrow right-of-way. The northwestern (interior) side is about 329.2 m (1080') long. The southeastern corner of the floodwall borrow area is at E5850, approximately opposite Levee Station 497. Thirteen transect lanes ran north-east/southwest.

The floodwall borrow area is covered by briar patches and scattered brush near the linear right-of-way. Farther inland, the ground is saturated and covered by a dense canebrake, grading into inundated marshland. Shovel tests in this parcel yielded silt with pockets of clay in the uppermost stratum to a depth of 10-20 cm. Below this stratum, peaty silt generally extends to a depth of 50+ cm. The peaty silt represents marshland soil accumulation in this area. The nearest deep soil profile at Boring LCL-2 (Sta. 498+50, roughly opposite E5900) revealed swamp deposits in this area (U.S. Army Corps of Engineers 1996:Plates F10 and F18).

Reforestation Mitigation Tract

In addition to the linear borrow right-of-way and the floodwall borrow area, a 39 acre reforestation mitigation site was surveyed. This parcel is adjacent to the western boundary of Bayou Segnette State Park and lies within the Churchill Farms reclamation tract (see Chapter

4). The southern boundary of the reforestation parcel is at an east/west drainage canal which forms the boundary between Sections 19 and 22. The eastern boundary of the parcel follows the drainage canal along the western (interior) side of the reclamation levee. The western and northern boundaries are unmarked, however, the western side runs roughly along the north/south boundary of Sections 19 and 20. The dimensions of the reforestation mitigation site are approximately 700 m (2296.56') north/south, 200 m (656.16') east/west at its southern end, 300 m (984.24') east/west at its widest point (at the easternmost bend of the reclamation levee), and 120 m (393.7') east/west at its northern end.

Transecting began at the southwestern corner of the tract. The transects were numbered sequentially from west to east B1-B15. Transects B1-B8 extended 700 m (2296.56') north/south. Transects farther east became progressively shorter (637 m [2089.87'] on B9 to 500 m [1640.4'] on B12) as they intersected the levee-side canal at their northern end. Much of the area is inundated; and the terrain in the bend of the reclamation levee, east of transect B12, was completely inundated.

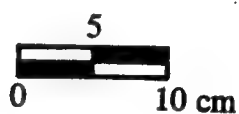
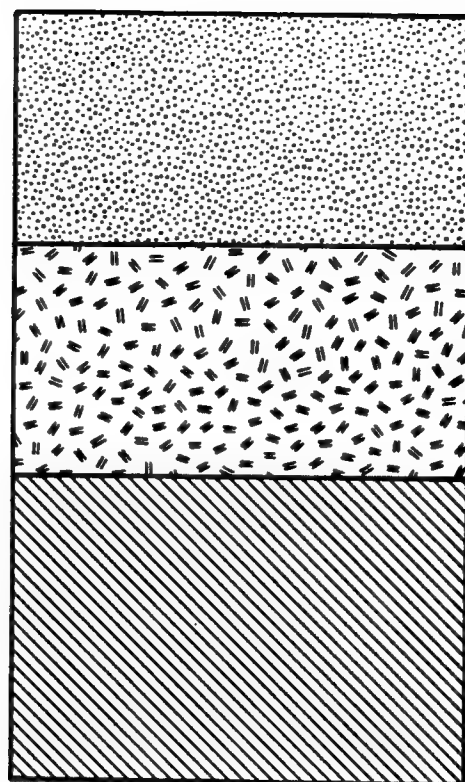
Shallow north/south drainage ditches intersected the east/west drainage canal approximately 90 m (295.27'), 140 m (459.31'), and 190 m (623.35') west of the levee-side canal. A low earth embankment running roughly east/west was noted at N360-370. Depressions or ditches running roughly east/west were noted at N370-375, N415-417, N402-398, and N432-436. These field drainage features probably date from the 1920s and 1930s. Transect B8 crossed a 10-30 cm high ridge or embankment at N250. This feature is 10-12 m (32.8-39.37') wide and runs almost north/south (ca. 350°/170°). This presumed roadbed extends from N200 to N350. The date of the roadbed construction is unknown. It may date to the initial reclamation of this tract, or it may have been constructed later. The terrain within the reforestation tract is grazed open woodland. The survey area is littered with modern artifacts (shotgun shells, garbage, etc., near B8 N420-423; a 180 cm long (70.87") section of railroad rail at B5 N322; and steel pipe at N314).

Shovel tests generally revealed silty clay or peaty silt above a bed of stiff clay. The top of the stiff clay was encountered at a depth of 15-30 cm. The peaty silt was present in the southern portion of the parcel, perhaps reflecting historically/recent dominance of marshland rather than woodland in the southern part of the tract. A representative shovel test containing the peaty silt stratum was B5 N325. This test exposed 10YR 3/1 (very dark gray) silty clay at 0-15 cm, 10YR 2/2 (very dark brown) peaty silt at 15-30 cm, and 10YR 4/1 (dark gray) stiff clay at 30-50+ cm (Figure 9).

Investigations at 16JE26

No archeological sites were observed within the 39 acre reforestation tract, but an historic equipment complex, designated as 16JE26, was recorded within the east/west drainage canal forming the parcel's southern boundary. This complex is at the intersection of the east/west canal with the canal beside the reclamation levee, but does not extend into the levee-side canal. The equipment is aligned east/west in the center of the drainage canal (Figure 10).

The complex probably represents a submerged vessel, with only iron and steel equipment attached to the deck exposed above the water level in the canal. The vessel tentatively was identified as a pullboat, but examination of historic plans and photographs suggest that it was a small dipper dredge. The western part of the complex consists of a horizontal steam boiler and attached firebox, whose combined east/west length is 4.2 m (14'). The sides of the cylindrical boiler are broken. Two heavy iron support braces are visible at the western end of the boiler. These supports probably originally held the boiler a safe height above the deck. The square firebox is attached to the eastern end of the boiler (Plate 1).






-  10 YR 3/1 (very dark gray) silty clay
-  10 YR 2/2 (very dark brown) peaty silt
-  10 YR 4/1 (dark gray) stiff clay

Figure 9. Profile of shovel test B5 N325.

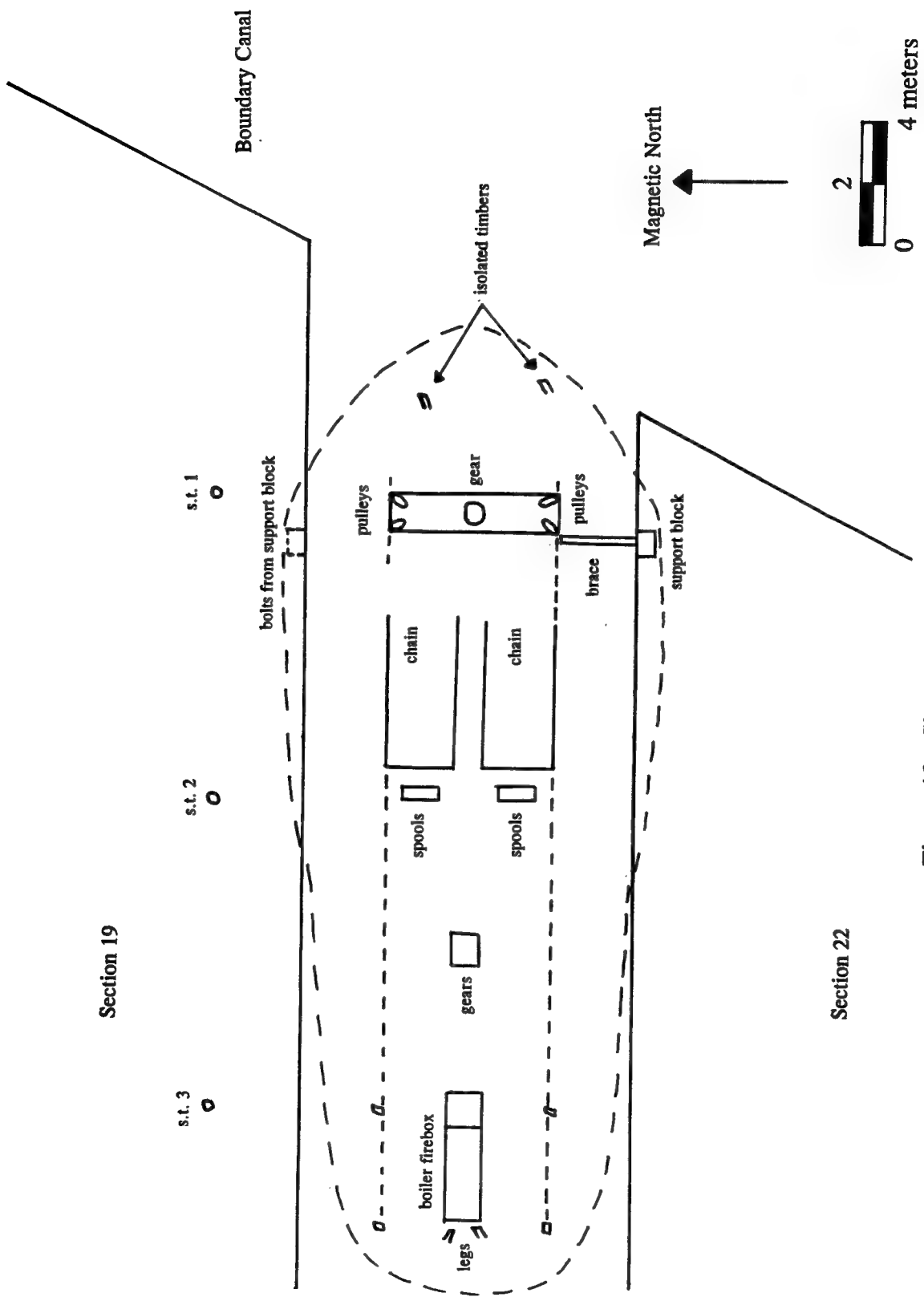


Figure 10. Site map of 16JE26.



Plate 1. Remains of the dipper dredge (16JE26).

A gear complex and a large, rectangular, wood plank platform lie several meters east of the firebox. This platform is 5.4 m (17.72') wide and 9 m (29.53') long east/west. Chain or cable supports are located at the western end of the platform. The largest spools apparently were made of wood cores encased by steel bands. Four heavy horizontal steel pulleys are located at the corners of the raised eastern end of the platform. A large steel horizontal sprocketed gear is located in the center of the raised platform. Dredge plans suggest this was the center of a turntable for the boat's bucket arm. Portions of heavy steel chain remain attached to some of the spools but only isolated fragments of steel cable and two heavy turn-buckles were noted along the north side of the platform. Dredge boat plans show that separate sets of chain or steel cables were utilized to rotate the bucket arm turntable, to raise or lower the pivoting bucket arm support, and to provide power to the dipper arm.

The equipment complex is surrounded by a rectangular outline of upright wood posts, some of them burnt near the top. The posts probably supported a wooden roof or superstructure covering the complex. The roof apparently burned. The outline of posts is 5.4 m (17.72') wide and 23.8 m (78.08') long east/west. Two large steel-plated wood beams attach the eastern end of the rectangular platform to the canal banks. The beam on the south side is covered by steel-plate 17 cm (6.75") wide and 2 cm (0.75") thick. The complete southern beam is attached to a support block (wood with vertical steel bolts) set at the southern bank of the canal. A partial pattern of steel bolts at the corresponding position on the northern canal bank probably represents a similar "anchor block". The canal is 10.9 m (35.76') wide; the distance between the outer edges of these blocks is 11.9 m (39.04'). The blocks correspond to the paired "spuds" used to stabilize dredge boats while excavating. Heavy steel "piling rods" were noted along the northern edge of the canal. Modern debris was present in the canal and along the canal banks.

Three supplemental shovel tests were excavated on the north bank of the canal, opposite the equipment complex. These tests were 3 m (9.84') north of the canal edge. The tests revealed silty clay over stiff clay, and no cultural materials were recovered. No artifacts were removed from the equipment complex.

The components of the equipment complex are consistent with a steam-powered dipper dredge, and enough details were present *in situ* to allow a positive identification (Figures 11,12,13). A thorough description of dipper dredges is provided by Prelini (1912):

The dipper dredge can be likened to an ordinary steam shovel mounted on a scow or float. This machine is very convenient for dredging in shallow waters and has been extensively used... It has done extensive and important work at a comparatively low cost...

The hull is built with a flat bottom, so as to allow the machine to float in very shallow water. The hull is always made of wood, formed with keelsons and floor planking caulked in the usual way. The deck is formed by beams connected to the keelsons by means of verticals, supporting a heavy caulked planking. The bow and stern sides of the hull are formed in the same way by beams planked and caulked. In dredges of large capacity, in order to support the heavy boom and its attachment and at the same time to stiffen the structure so as to prevent any damage, the hull is reinforced by steel trusses. Two trusses are placed longitudinally along the starboard and port sides of the float, and these are well braced together by crosspieces connecting the top and bottom chords of the trusses. Another truss, but smaller, is placed at the bow and connected with the two longitudinal ones. This is necessary to support the turntable upon which the boom rests...

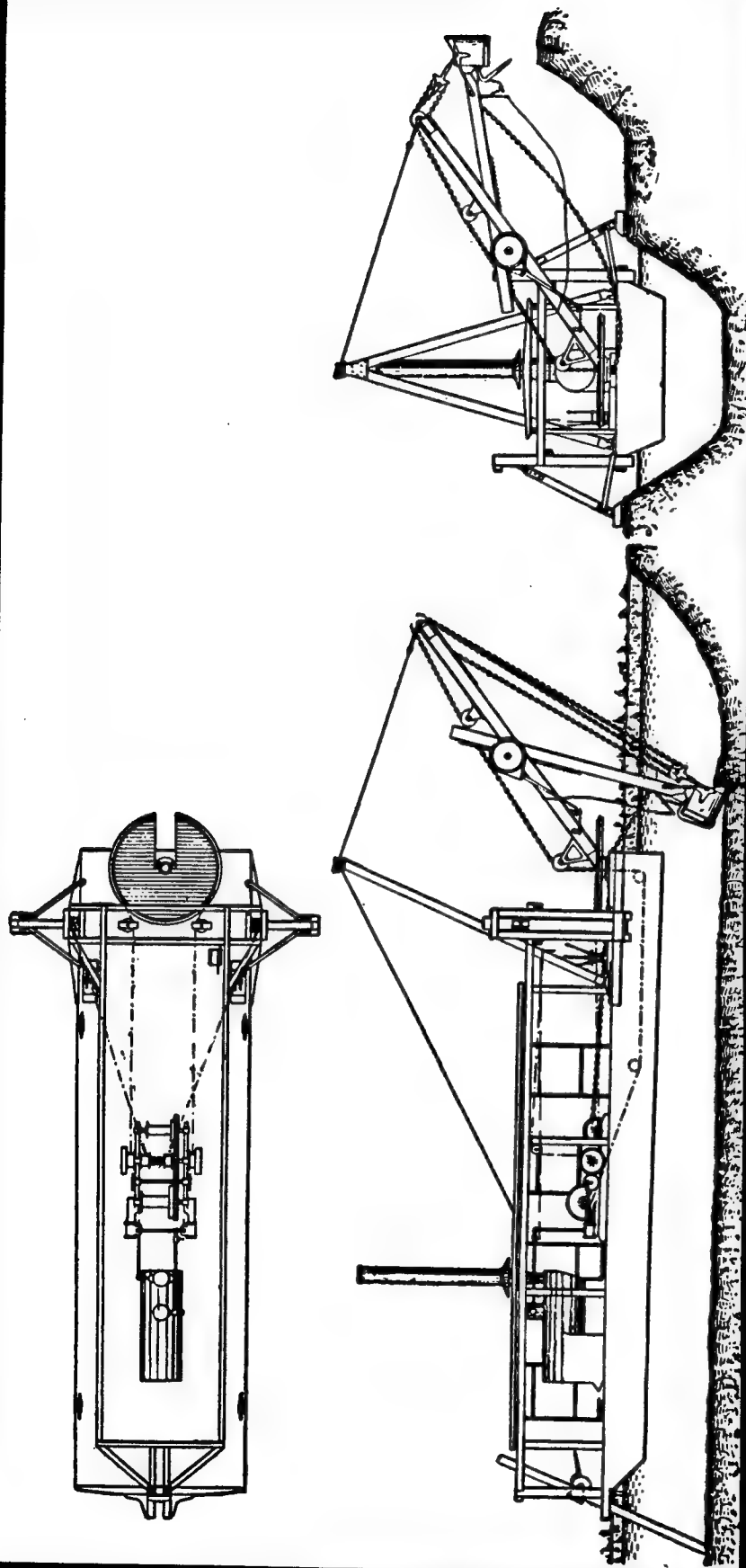


Figure 11. Plan view, profile, and end view of a typical small dipper dredge with bank spuds
(from Prelini 1912:153).

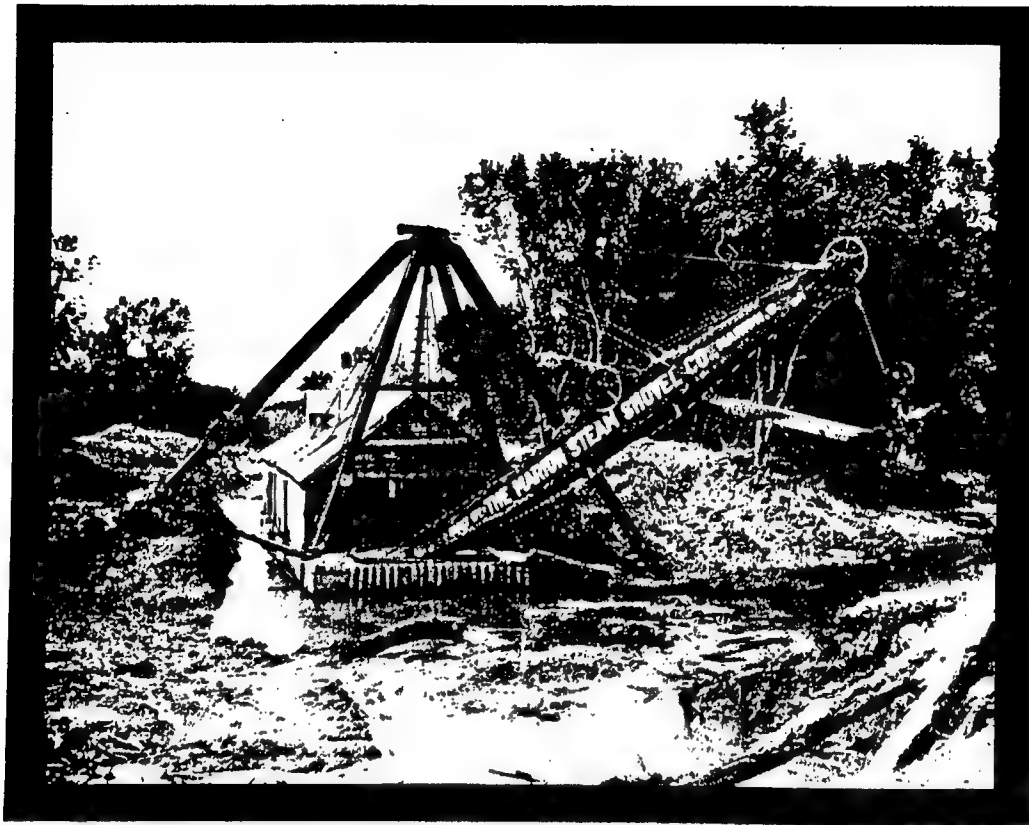


Figure 12. A dipper dredge with bank spuds at work excavating a canal (from Simon 1920: 39).

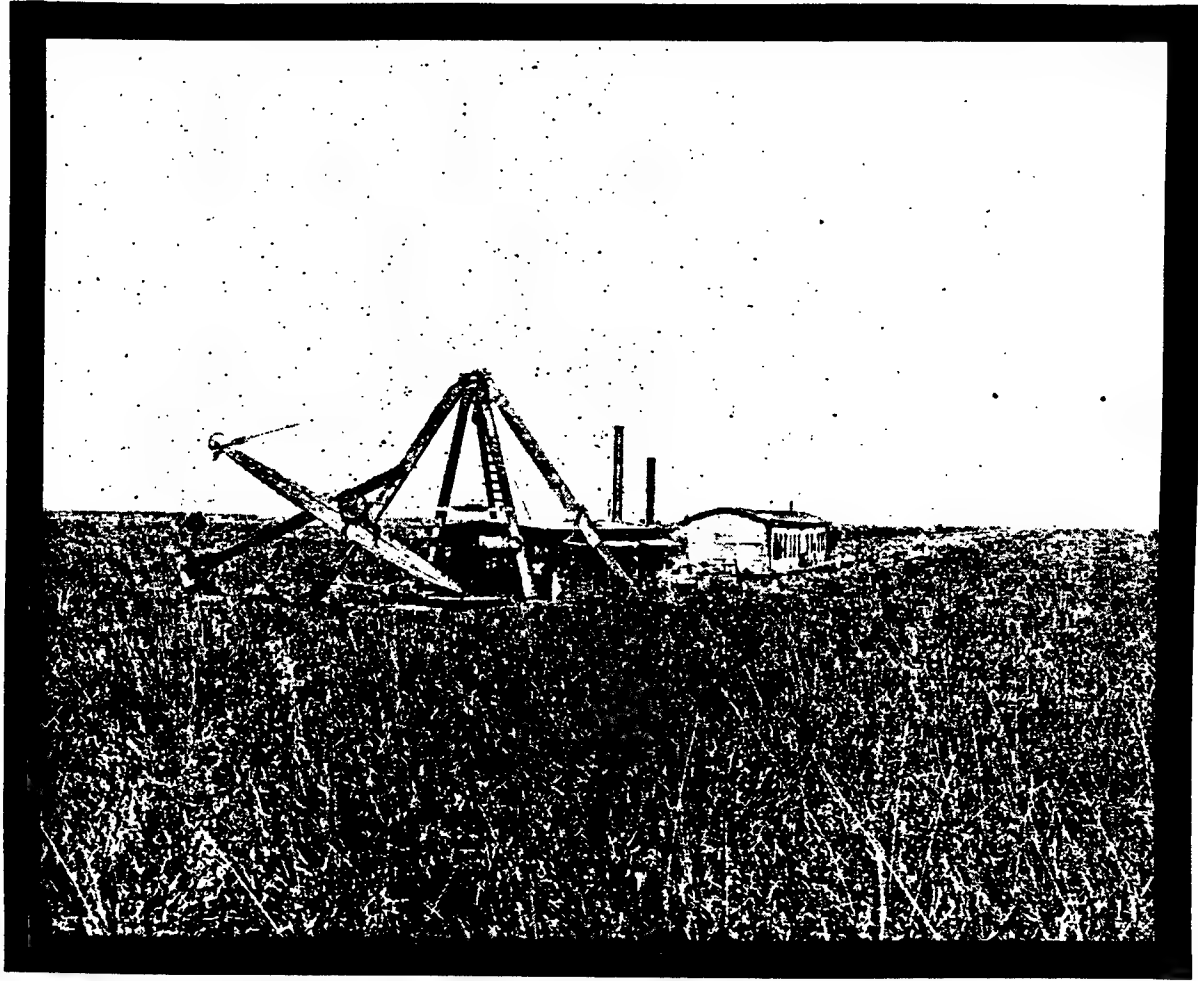


Figure 13. A dipper dredge working in a southern Louisiana marsh (from Chappuis n.d.:101).

To prevent the dipper dredge from tilting under the great strain of the work, the hull is provided with three and sometimes even four spuds. These are heavy square beams which are sunk into the ground so as to firmly support the float in the same manner as the legs of a table...

Spuds may be either vertical or inclined; in the latter case they rest on the banks of the canal to be excavated by the dredge, and are called bank spuds. They are used only on dredges of small capacity when employed in the excavation of small and shallow canals...As a rule dredges are provided with three spuds--two of them located at the bow either side of the frame supporting the boom, and these are of larger dimensions than the spuds at the stern... To facilitate the penetration of the spuds into the ground their lower end is provided with heavy castings. The raising and lowering of the spuds is done by means of steel wire ropes passing over sheaves and controlled by special engines. The rope for lowering the spuds passes over a grooved sheave fixed at the top of the spud, and its free end is fastened to the forward side of the spud casting. The rope for raising the spud is also attached to the forward castings and passes around the sheave in a slot close to the foot of the spud. The other ends of the rope are attached to opposite ends of the drum of the spud engine. The spud at the stern is operated by a rope fastened to the bottom of the spud and passing over a sheave on deck and thence to the drum of another engine.

The dredging apparatus consists of a steam shovel proper of large dimensions and made up as usual of an A frame supporting a swinging boom with its dipper handle and bucket.

The A frame is composed of two slanting beams firmly fixed to the keelson of the hull and resting on top, one against the other, thus forming a truss in the shape of the letter A. This frame is a little inclined toward the front and it is held in position by iron rods or backstays provided with turnbuckles fixed to the stem. In dredges of small capacity the A frame is generally composed of two simple wooden beams... The top of the A frame is always furnished with a gudgeon pin around which swings the iron rod supporting the top of the boom. According to the capacity of the dredge the A frame is made of different heights, varying from 16 or 20 ft. in the smallest up to 75 ft. in dredges of large capacity.

The boom or jib is a heavy trussed steel beam with a long slot in the middle kept in an inclined position by iron rods, holding its upper end to the top of the A frame, while its lower end rests on a revolving table. The trussed beam forming the boom is usually made with the lower chord straight and the upper one curved or vice versa... The length of the boom varies with the capacity of the dredge and it is made of different lengths, varying from 20 to 50 ft. It is the swinging of the boom that causes the bucket to revolve in a large radius, thus covering a large field from a single station. The swinging of the boom is done by means of a turntable in whose center is fixed the lower end of the boom. The turntable is built up of steel plates and angles and is supported by steel wheels moving along a circular track, of varying diameter, reaching to 20 ft. on the larger dredges. The turntable is provided with a horizontal groove around which passes a chain or rope wound around the drum of a reversible engine. By paying the rope in or out the turntable is turned, carrying with it the boom.

The dipper handle is made of wood reinforced at the sides with iron wearing plates. In small dredges the lower side is provided with a cog rack which travels on pinions mounted on the boom. These pinions are connected with a wheel controlled by a brake so that the dipper can be held in any position... The dipper handle is inserted in the slot of the boom and it is made of different lengths, depending upon the depth at which the dredge is designed to work.

The dipper or bucket is similar to the one used on steam shovels. The sides are built up of heavy steel plates riveted to angle irons, while the bottom is only hinged to the back, forming a trap door, which is kept closed by a spring latch. The latch is easily opened by simply pulling a chain, but closes automatically as soon as the dipper is lowered again... Buckets are made of different sizes varying between 1 and 12 cu. yds... The bucket can be fixed to the handle in different ways, which vary with the different manufacturers. The boom line operating the bucket is attached to the bail, passes over a large grooved sheave on top of the boom, and passing over and along the upper side of the boom and over a second large grooved sheave on the turntable, is wound around the large drum of a reversible hoisting engine. The line can be either of chains or steel wire cables, the latter being preferred, owing to the lighter weight and less friction, which means less wear.

The various engines necessary for the operation of the dipper dredge are the main hoisting engine, the swinging engine, the engine for the spuds, and an engine for the dynamo. The main hoisting engine is usually of the double-cylinder, double drum, reversible type, and is located on the main deck forward. The swinging engine also is located forward and of the double-cylinder, double-drum reversible type. The spuds can be operated by a single or two separate engines... An engine is also required for the dynamo, since the dredge is lighted by electricity and arc lamps are provided on deck so as to dredge even at night. Steam for the various engines is provided by a marine boiler located near the stern. Boiler, water tanks, coal bunkers and some of the engines are placed aft so as to counteract the weight of boom with the heavy bucket when the dredge is in operation, notwithstanding it is firmly fixed to the ground by means of spuds.

All the various dredging operations are controlled by a man who operates the different engines by means of levers, all located in the captain's room on deck...

The dipper dredge is a stationary machine and consequently is entirely without propelling apparatus or engine. It is able, however, to move from place to place so as to follow the progress of the work without any help from tugboats or from the anchoring chains. When the dredge is to be moved so as to attack a new bed, the spuds are lifted, the dipper handle fully extended is lowered so as to engage the soil as in dredging, the handle is then withdrawn and this effort causes the vessel to move forward. By repeating the same operation the machine slowly advances to the required point. Then the spuds are lowered again, the boat is made firm and the dredging operations are resumed. It takes less than two minutes to lift the spuds, to move to a new place to be dredged and lower the spuds again. The machine can be moved also laterally by rotating around one spud...

The output of the dipper dredge is an average of one bucket per minute, and for this reason contractors have continuously requested manufacturers to increase

the capacity of the bucket... However, dipper dredges of small capacity working under certain conditions are still considered the most efficient and economical machines. The dipper dredge of small capacity is handled by a crew of 6 men, while this number increases with the capacity of the machine...

The dipper dredge is the typical American dredge... the old-time dipper dredge of small capacity can be still considered without a rival on small contracts for the improvement of narrow rivers and in digging canals for draining purposes when the débris is deposited on both sides to form the levee. The dipper dredges of small capacity are handled by a few men, are not easily broken, and the repairs are almost insignificant... [Prelini 1912:151-160, *sic* throughout]

The operation of dipper dredges is described by Simon (1920):

Dippers require two men to operate the boom, dipper stick and bucket, in addition to the usual crew of engineer, firemen, oilers and deck hands. One, the "operator" or "runner," controls the bucket hoist, backing chain and boom motion through the throttles and frictions of the main, backing, and swinging engines. The other, the "cranesman" or "dipper tender," is stationed at the boom heel and regulates the dipper stick frictions on the boom and opens the bucket.

In the process of digging, the runner slacks the bucket wire or wires, permitting it to drop into the water, at the same time pulling it back toward the hull by stressing the backing chain. The cranesman releases the dipper stick frictions so that it falls through the boom until the dipper rests on the bottom. The runner releases the backing chain and stresses the hoisting wire, and the dipper tender applies his friction bands, gripping the dipper stick at the boom. The bucket, therefore, cuts its way forward in an arc of radius equal to that portion of the dipper stick below the boom until it is loaded and clear of the mud, whereupon the cranesman releases the stick, which shoots up through the boom. The runner swings the boom until the bucket is suspended over a pocket of the scow [if a scow is used] and the cranesman pulls the latch string, dumping the bucket...[Simon 1920:41-42].

The machinery components observed are therefore probably remains of a dipper dredge utilized in excavation of the drainage canals on the Churchill Farms reclamation tract after 1923. The hull of the vessel probably rests on the bed of the drainage canal. An aerial photograph taken in 1950 shows the boat in its present position, however, resolution is not sufficient to evaluate the vessel's condition at that date (Photo courtesy of New Orleans District, U.S. Army Corps of Engineers). The bow of the vessel, which supported a dipper dredge, faces eastward. Any copper and brass fittings or tubing have been removed. The boat's superstructure is gone, only the lower ends of upright support posts remaining. Nonetheless, the major components of the dredge boat equipment other than the bucket arm remain in position. This vessel has been designated the Reclamation Tract site and has been assigned the site number 16JE26.

CHAPTER 7

SUMMARY AND RECOMMENDATIONS

Intensive pedestrian survey was undertaken for the Westwego to Harvey Canal Hurricane Protection Project, Lake Cataouatche Area, Jefferson Parish, Louisiana. Areas surveyed included a 6.6 mile (10.7 km) levee corridor, a 15 acre floodwall borrow area, and a 39 acre reforestation mitigation area. No archeological sites or historically significant standing structures were encountered within the survey area. No further work is recommended within the study area.

One new site was identified on the boundary of the reforestation mitigation area, however. 16JE26, also named the Reforestation Tract site, consists of the remains of a dredge boat including a wooden platform, metal pulleys, chain and an iron fire box. 16JE26 is associated with the reclamation of marshland for agriculture, a widespread movement in coastal Louisiana in the first half of the twentieth century. The site is thus associated with the theme of the Euro-American Influence on the Landscape identified in *Louisiana's Comprehensive Archaeological Plan* (Smith et al. 1983:279). Therefore, the site should be considered potentially eligible for nomination to the National Register of Historic Places pending the results of additional investigations. The site lies within the section line canal between T14S R23E, Sections 19 and 22. The use of the designated 39 acre parcel within Section 19 as a reforestation mitigation site therefore will not adversely impact the archeological site. No further work is recommended at this time. If future plans include impacts to the site, additional field investigations and documentation are necessary to establish the historical significance and integrity of 16JE26.

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United States Geological Survey 7.5-Minute Quadrangle Maps

New Orleans West 1932, 1938, 1951, 1965 (Photorevised 1972, 1975), 1992

Lake Cataouatche East 1932, 1952, 1966 (Photorevised 1972, 1979, 1982)

Luling 1938, 1951, 1967, 1992

ARCHIVAL SOURCES

Jefferson Parish Clerk of Court's Office, Gretna

Conveyance Office Books (COB)

Township Plat Books

APPENDIX I
SCOPE OF SERVICES

**SOLICITATION FOR
DACW29-97-Q-0024
CULTURAL RESOURCES INVESTIGATIONS
FOR WEST BANK HURRICANE PROTECTION
LAKE CATAOUATCHE AREA, JEFFERSON PARISH, LOUISIANA.**

1. Introduction

The U.S. Army Corps of Engineers, New Orleans District seeks proposals for cultural resources investigations of the Westwego to Harvey Canal Hurricane Protection Project, Lake Cataouatche Area, Jefferson Parish, Louisiana. The work will consist of historic and background records research along with cultural resources surveys of portions of the project area to be impacted by construction and a reforestation mitigation area. Comprehensive draft and final reports for the investigation of the project area are to be provided.

The investigations are to be conducted using standard archeological procedures for the identification and recordation of historic properties within portions of the project area where impacts to cultural resources are likely to occur. The time period for this work item is 32 weeks.

2. Submitting Proposals

The Contractor shall include a detailed written proposal containing the following four elements, at a minimum:

a. technical proposal - The Contractor's proposal should provide an interpretation of the scope, the Contractor's research plan/design for the work, support of the cost proposal, and any suggested modifications to the scope of services.

b. cost proposal - This should be provided by task or phase. Minimally, the phases defined in the scope will be separately listed. Additionally, a budget summary showing the total number of units for each line item by phase/task shall also be included.

c. organizational chart - A chart showing the staff proposed for the study shall be provided. Additionally, resumes for

professional personnel shall be provided. The chart will provide names of personnel, number of hours assigned to each person, and an estimate of each person's percentage commitment to the work by month.

d. Accident Prevention Plan (APP) - The Contractor shall submit one copy of a draft APP (LMV Forms 358-R and 359-R). The reference for preparation of the APP is EM 385-1-1, Oct 92 or as updated at acceptance of this purchase order. The draft APP will be reviewed by the New Orleans District Safety Office. All New Orleans District comments will be resolved in a final APP prior to the commencement of any fieldwork. Specific New Orleans District safety requirements include:

1. each field crew must contain at least two persons with current CPR and Basic First Aid training,
2. any person performing fieldwork alone in remote areas must be certified in CPR and Basic First Aid,
3. local hospital and ambulance arrangements are required for all fieldwork, and
4. all APP's are required to address the organization's policies and procedures for the prevention of alcohol/drug abuse.

3. Award and Delivery Address

After review, clarification (if necessary), and approval of the Contractor's proposal and cost estimate, the Contracting Officer shall issue award. This purchase order will be issued on a fixed price basis.

All deliverable items including but not limited to proposals, reports of progress, draft and final reports, shall be delivered to Mr. James M. Wojtala, Contracting Officer's Representative (COR), CELMN-PD-RN, Corps of Engineers, New Orleans District, P.O. Box 60267, New Orleans, Louisiana 70160-0267.

4. Study Area

The study area is located on the west bank of the Mississippi River and is generally bounded by Bayou Segnette to the east, Lake Cataouatche to the south, the Mississippi River to the north, and the Jefferson Parish/St. Charles Parish line to the west.

The study area includes an approximately 12.8 mile long corridor. The corridor extends south from the Southern Pacific Railroad along the existing Greater New Orleans Landfill access road (South Kenner Road), then west parallel to the shoulder of the westbound lanes of U.S. Hwy. 90 for approximately 700 feet, then south following the existing non-Federal levee at the south side of U.S. Hwy. 90 and extending to the southern limits of Bayou Segnette State Park. The project corridor continues north through Bayou Segnette State Park to an area in the vicinity of the Bayou Segnette Pumping Station as shown on the project maps (Attachment 1).

Specific locations of the study area to be surveyed for cultural resources include the following:

a. an approximately 6.6 mile reach of the levee corridor from Levee Sta.'s 156+00 to 506+30.74. The investigations will be conducted in portions of the study area to be impacted by shifting the interior drainage canal north as part of the construction of an interior stability berm. Varying widths and corresponding levee stations are shown on plates four through eight of the project maps.

b. an approximately 15 acre floodwall borrow area to be located west of Bayou Segnette State Park and shown on Plate 8 of the project maps.

c. an approximately 39 acre reforestation mitigation area shown on Attachment 2.

5. Background Information

The U.S. Army Corps of Engineers, New Orleans District's (NOD) report entitled Westwego to Harvey Canal, Louisiana Hurricane Protection Project, Lake Cataouatche Area Draft Post Authorization Change Report and Draft Environmental Impact Statement (DEIS) was completed in August 1996. The report identifies a tentatively selected plan (TSP) which provides additional hurricane surge

protection for the study area by tying the line of protection to the authorized Westwego to Harvey Canal project. The TSP combines flood walls with levee construction and improvements to provide the necessary level of protection for the project. An interior stability berm and exterior wave berm are features to be constructed under the TSP.

Cultural resources concerns related to the construction of the TSP and mitigation features of the project were addressed in the DEIS. A historic land use study was completed for the project during 1994 (Maygarden et al. 1994). An in-house geomorphic investigation of the project area was conducted by NOD during 1996. The results of these studies are to provide points of departure for synthesizing and describing the historic and geomorphic background of the study area and for developing a context for evaluating cultural resources within the study area.

6. Study Requirements

The study will be conducted utilizing current professional standards and guidelines including, but not limited to:

- the National Park Service's National Register Bulletin 15 entitled, "How to Apply the National Register Criteria for Evaluation";
- the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation as published in the Federal Register on September 29, 1983;
- Louisiana's Comprehensive Archaeological Plan, dated October 1, 1983;
- The Advisory Council on Historic Preservation's regulation 36 CFR Part 800 entitled, "Protection of Historic Properties".

The study will be conducted in three phases. Phase 1 will consist of a literature search and records review; Phase 2 will consist of intensive survey and site recordation; Phase 3 will consist of data analysis and report preparation. Full rights-of-entry are available for completing the work effort.

a. Phase 1: Literature Search and Records Review. The Contractor shall commence, upon work item award, with a literature, map, and records review specific to the study area. This phase shall include the review and synthesis of literature provided during previous research including but not limited to a review and synthesis of the archeological, historical and geomorphologic reports covering the study area. The State Archeologist's site and standing structure files and the National Register of Historic Places will be consulted to establish a current and complete distribution of historic properties in the vicinity of the study area.

At a minimum, the background research and records review will be sufficient for developing the historic context(s) of the study area and should be to a level sufficient for assessing the significance of any sites recorded as a result of the Phase 2 investigations. A detailed chain of title for the study area is not required for this study.

b. Phase 2: Intensive Survey and Site Recordation. Field investigations shall commence within 20 days of award date. The investigations shall consist of an intensive pedestrian survey and subsurface testing in each of the three areas described in Section 2 above. The intensive pedestrian survey will be conducted along transects spaced at no greater than 20 m intervals. Shovel tests will be excavated at a maximum of every 50 m; shovel tests on adjacent transects will be offset. Shovel tests will be approximately 30 cm in diameter and will be excavated 50 cm deep or to sterile subsoil. This procedure will be supplemented with additional shovel tests which will be excavated where high probability areas for cultural resources may occur or where indications of cultural resources are present. Soils from each shovel test will be screened through 1/4 in (.6 cm) hardware cloth. Soils with high clay content may be hand trowelled to detect the presence or absence of artifacts. The stratigraphy, soil characteristics and a description of artifacts will be recorded for all excavations. All excavations will be backfilled upon completion of the recordation process.

Sites identified during the survey will be mapped, photographed, and plotted on the appropriate USGS 7.5' series topographic quadrangle and copies of the project maps provided as Attachment 1. It is anticipated that no more than three sites will be identified as a result of these investigations. Additional shovel

tests will be excavated to determine the nature and extent of each site (i.e., cultural affiliation, integrity, preservation, size, depth, stratigraphy, etc.).

A brief management summary succinctly reporting the results of the intensive survey and site recordation shall be submitted to the COR within 10 days of completion of the fieldwork. (See Section 9a. below).

c. Phase 3: Data Analysis and Report Preparation. All data will be analyzed using currently acceptable scientific methods. The Contractor shall catalog all artifacts, samples, specimens photographs, drawings, etc., utilizing the format currently employed by the Office of the Louisiana State Archaeologist. The catalog system will include site and provenience designations.

All background literature and records research, fieldwork and laboratory data will be integrated to produce graphically illustrated, scientifically acceptable reports discussing the project as a whole. The Contractor will synthesize the archeological, historical, and geomorphologic information obtained during Phase 1 with the results and observations of the field survey to assess the nature of the resources base in the study area. The Contractor will complete and file state site forms with the Office of the Louisiana State Archaeologist and cite the resulting state assigned site numbers in all draft and final reports of this investigation. The Contractor shall provide preliminary site assessments and discussions on the potential project impacts for any given resource identified within the study area.

7. Discovery of Human Skeletal Remains

In the event that the field survey and site recordation procedures performed during this study encounter unmarked burial sites or human skeletal remains, the provisions of the Louisiana Unmarked Human Burial Sites Preservation Act [Louisiana R.S. 8:671 through 681 and R.S. 36:209(I) and 802.13] shall apply. Upon discovery of such remains, the Contractor shall immediately cease activities which could further disturb the unmarked burial, human skeletal remains or associated burial artifacts. The Contractor will notify the COR of the discovery as soon as possible to determine the appropriate plan of action regarding the discovery. The Contractor will also be responsible for notification of the law enforcement agency with jurisdiction over the remains within 24

hours of its discovery. The COR will notify the Louisiana Division of Archaeology of the discovery. In no event will human skeletal material be excavated and/or collected from the field with approval of the COR.

8. Performance of Purchase Order

The Contractor will be required to commence work within 10 calendar days of award. The Contractor shall perform the necessary work on each assignment continuously as working conditions permit.

When it becomes necessary for the Government to stop work on any assignment because of unforeseeable circumstances which are beyond the control of the Contractor, the Contracting Officer or his representative will give the Contractor a minimum advance notice of five (5) calendar days.

To perform the required work, the Contractor shall provide all professional staff, support staff, and specialists necessary to plan, supervise, perform and report the required work. The Contractor's staff shall have demonstrated experience in successfully identifying and assessing the significance of prehistoric, proto-historic and historic resources present within the New Orleans District. The Contractor will furnish all labor, plant, transportation, fuel, equipment, and material necessary to perform the services required by this purchase order. The Contractor shall also provide adequate professional supervision to assure the accuracy, quality, and completeness of all work required under this purchase order.

9. Reports

a. Management Summary Report. Two copies of a management summary report will be submitted to the COR within 10 days after completion of Phase 2. The report will summarize succinctly, the results of phases 1 and 2 research. If cultural resources are identified as a result of the survey, the report will provide a description of the condition of each site. The location of each site will be shown on project maps which will be included with the management summary report. The summary report is not intended to be a lengthy interim report, but shall contain enough information to serve as a planning aid and a means for informing the COR.

b. Monthly Progress Reports. One copy of a brief and concise statement of progress shall be submitted on a monthly basis throughout the duration of the purchase order. These reports, which may be in letter form, should summarize all work performed, information gained, or problems encountered during the preceding month. A concise statement and graphic presentation of the Contractor's assessment of the monthly and cumulative percentage of total work completed by task shall be included each month. The monthly report should also note difficulties, if any, in meeting the purchase order schedule.

c. Draft and Final Reports. Four copies of a draft report integrating each phase of this investigation will be submitted to the COR for review and comment within 14 weeks after award date. The COR will provide all review comments to the Contractor within 8 weeks after receipt of the draft report. Upon receipt of the review comments on the draft report, the Contractor shall incorporate or resolve all comments and submit one preliminary copy of the final report to the COR within 4 weeks (26 weeks after award). Upon approval of the preliminary final report by the COR, the Contractor will submit one reproducible master copy, one copy on floppy diskette, 35 copies of the final report, and all separate appendices to the COR within 6 weeks (32 weeks after award).

Computer disks of text and tables of the final report will be submitted in Microsoft Word for Windows or Word Perfect format. Disks containing database files will be provided in dbf format. Spreadsheet files will be provided in Excel .xls format. Computer map files will be provided in Intergraph or Intergraph-compatible format. Graphics files will be submitted in tif or other COR approved format. Each diskette will be clearly labeled with the following information at a minimum: report title, report number, contractors name, file names and format. The Contractor shall also supply a complete listing of all computer files submitted. This listing will include file names, file types, disk number, and file description (e.g. Chapter 1, Figure 5, 1862 design file overlay, etc.). The Contractor will complete and submit to the COR the Defense Technical Information Center (DTIC) Form 530.

The draft and final reports shall follow the format set forth in MIL-STD-847A with the following exceptions: (1) separate, soft, durable, wrap-around covers will be used instead of self covers;

(2) page size shall be 8-1/2 x 11 inches with 1-inch margins; (3) page numbering with Arabic numerals will begin with the first page of Chapter 1 of the report; (4) the reference format and report style will follow American Antiquity guidelines. Spelling shall be in accordance with the U.S. Government Printing Office Style Manual dated January 1973. The report cover and the inclusion of a report documentation page will conform to the New Orleans District Cultural Resource Report Series standards and specifications. A copy of a letter to the reader prepared by the COR will be included in the final report.

All records, photographs, artifacts and other material data recovered under this work effort shall be recorded, processed, and catalogued in a manner compatible with those systems utilized by the Louisiana State Historic Preservation Office and Federal agencies which store archeological data. Archeological collections and associated records to be permanently curated shall be prepared to meet the standards of 36 CFR Part 79, Curation of Federally-Owned and Administered Archeological Collections. They shall be held and maintained by the Contractor until completion of the purchase order in a manner compatible so far as possible with these standards. Collections may be inspected by representatives of this office. Final disposition of the artifacts and records will be in accord with applicable Federal and State laws. Unless otherwise specified, artifacts will be returned to the landowner or permanently housed with the Louisiana Division of Archaeology and Historic Preservation or in a repository selected by the COR. The Contractor shall be responsible for delivery of the analyzed archeological materials to the individual landowners, the Louisiana SHPO's office, or any other repository designated by the Government following acceptance of the final report. The Principal Investigator shall inform the COR in writing when the transfer of data has been completed and shall forward to the COR a catalog of items entered into curation. The location of any notes, photographs or artifacts which are separated from the main collections will be documented in the catalog.

10. Partial Payments

Payments will be made in accordance with the following schedule upon submission of proper invoices and acceptance of the deliverables by the COR.

Milestone	% of Total	Cumulative Amount %
a. Submission of Management Summary	40%	40%
b. Acceptance of Draft Report	45%	85%
c. Acceptance of Final Report, Written Notification of Transfer of Data and Acceptance of Catalog	15%	100%

11. Attachments

Attachment 1: Project Plan Maps (Plates 1-14).

Attachment 2: Plan Map showing the location of reforestation mitigation area.

12. References

Maygarden, Benjamin H., Sophie Burton and Kenneth Jones

1994 Land Use History for Westbank Hurricane Protection, Lake Cataouatche, Jefferson Parish, Louisiana. Report submitted by Earth Search, Incorporated to the U.S. Army Corps of Engineers, New Orleans District.

U.S. Army Corps of Engineers, New Orleans District

1996 Geomorphic Investigation of Lake Cataouatche Area, Louisiana. Report in preparation.

U.S. Army Corps of Engineers, New Orleans District

1996 Westwego to Harvey Canal, Louisiana Hurricane Protection Project Lake Cataouatche Area Draft Post Authorization Change Report and Draft Environmental Impact Statement. Draft report prepared by U.S. Army Corps of Engineers, New Orleans District.

APPENDIX II

**GEOMORPHIC INVESTIGATION OF THE
LAKE CATAOUATCHE HURRICANE
PROTECTION LEVEE AREA**

**GEOMORPHIC INVESTIGATION OF THE
LAKE CATAOUATCHE HURRICANE
PROTECTION LEVEE AREA**

November 5, 1996

INTRODUCTION

Purpose and Scope

The purpose of this study was to define the geomorphology of the project area in order to assist the archaeologist in identifying and evaluating cultural resources in the area affected by the proposed project. Major objectives of this study are as follows: a) map the geomorphic features or landforms in the study area, b) reconstruct to the extent possible the geomorphic development of the study area, c) define the geomorphic processes that have been and are presently active in the project area, and d) determine the archaeological significance of the geomorphic features, especially in terms of aiding in the location of previously undiscovered archaeological sites. This investigation consisted of four primary tasks: a) geomorphic mapping of the project area, b) limited field reconnaissance and soil sampling of selected landforms, c) data reduction and analysis, and d) report preparation.

Study Area

The study area is located in southeastern Louisiana between the Mississippi River and Lake Cataouatche near Avondale, LA (Figure 1). The study area is part of the Mississippi River deltaic plain and was formed by the deposition of Mississippi River sediments during the past 4,700 years. The project boundary incorporates the Mississippi River on the northern margin and Lake Cataouatche on the southwestern border.

Physiography

The dominant physiographic feature in the study area are the broad natural levees associated with the Mississippi River. The study area consists mainly of natural levee, swamp, and marsh deposits. Elevations are greatest on the natural levees of the Mississippi River. Natural levee elevations typically range from about 2 to 15 ft (0.5 to 4.5 m) above National Geodetic Vertical Datum (NGVD). The lowest elevation occurs in the marsh with the elevation approximately at sea level. Major population and industrial centers in the study area are located on the natural levees of the Mississippi River.

Geomorphic Mapping

The first objective of the study was to identify and map the geomorphic features within the project area. Mapping was done at a scale of 1:24,000 on a composite 7-1/2 minute USGS topographic base map of the project area. The base map was constructed from portions of three USGS topographic quadrangles (Luling, Lake Cataouatche East, and New Orleans West).

Delineation and definition of the primary geomorphic features was accomplished primarily by analysis of topographic data and aerial photography (1:24,000 scale, black and white, Tobin photography flown in May 1958; 1:60,000 scale, and 1:24,000 scale, color infrared photography

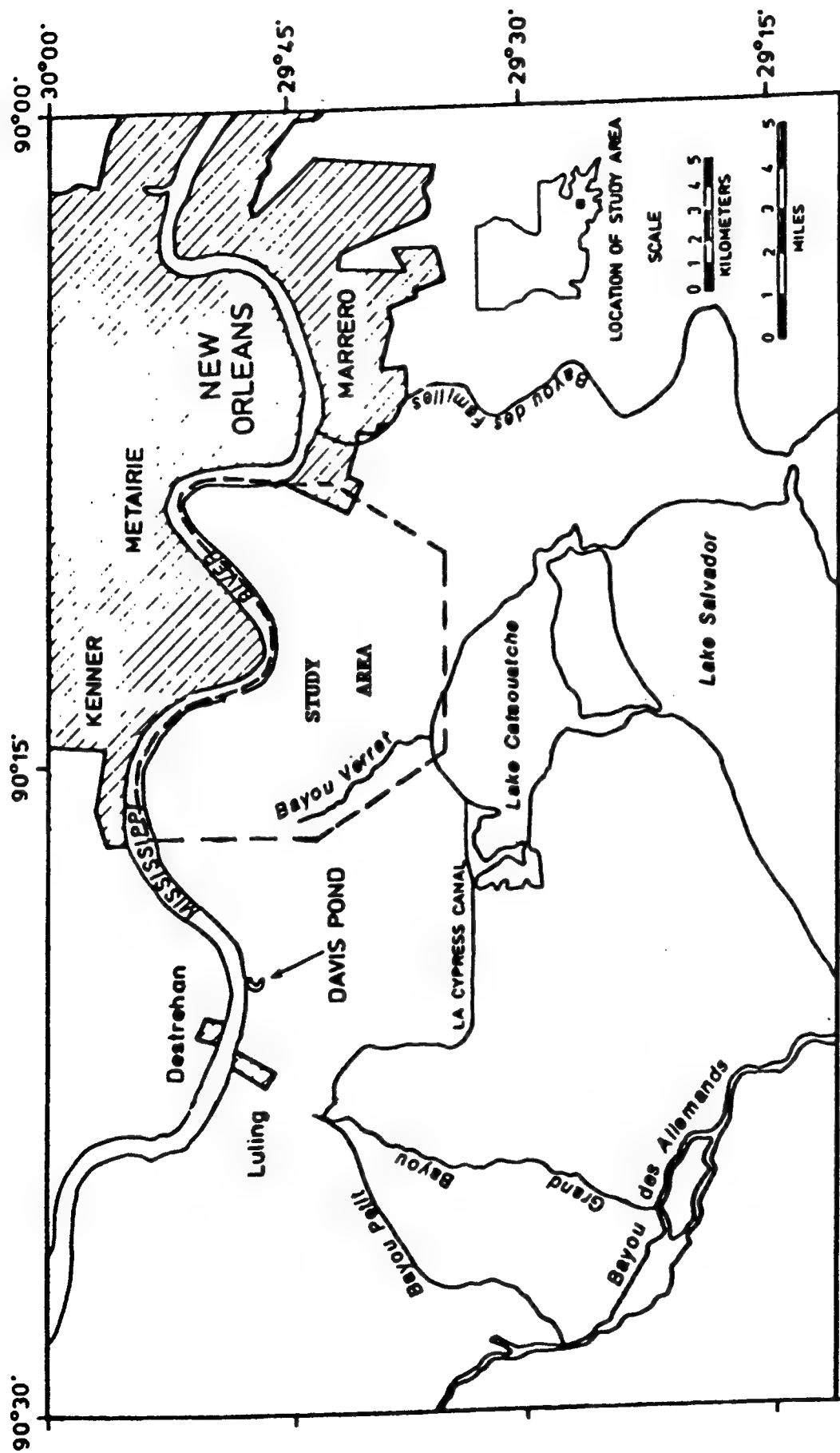


Figure 1. Location of study area.

flown in November 1988). The criteria that were used to define the various geomorphic environments present in the study area and their characteristics are explained in detail in the next section of this report.

GEOMORPHOLOGY

Surface Environments of Deposition

Natural Levees

Natural levees are formed by vertical accretion when the river or distributary overtops its banks during flood stage, and sediment suspended in the flood flow is deposited adjacent to the channel. The resulting landform is a low, wedge-shaped ridge decreasing in thickness and grain size away from the channel.

Natural levees adjacent to the Mississippi River and those bordering abandoned distributaries are the dominant surface feature in the study area. Natural levee deposits adjacent to the Mississippi River are from 0.5 to 2.0 miles in width. Distributary natural levees have generally subsided below the surface in the study area. The thickness of distributary natural levees is unknown but probably range from 5 to 10 feet in thickness.

Natural levee deposits in the study area are composed of clay, silt, and fine sand. These deposits are generally coarser grained near the channel and become finer-grained further away from the channel, grading towards uniform clay. Color varies from reddish brown or brown near the surface to various shades of gray with depth. Organic content is generally low and is in the form of small roots and disseminated wood fragments. Frequently associated with natural levee deposits are small calcareous nodules, formed as a result of ground water percolating through permeable soils. Natural levee soils are well drained, have low water contents, and generally have a stiff to very stiff consistency.

Distributary Channels

Distributary channels are channels that diverge from the trunk channel dispersing or "distributing" flow away from the main course. By definition, distributary channels do not return flow to the main channel on a delta plain (Bates and Jackson, 1980). However, numerous exceptions defined in the literature indicate that this relationship is not necessarily valid in the distributary channel classification (Shlemon, 1972; Wells and Roberts 1981; Van Heerden and Roberts, 1980).

Distributary channels originate initially as crevasse channels during high flow periods when the trunk channel is unable to accommodate a large volume of discharge. If the flood is of sufficient duration, a permanent distributary channel is soon established through the initial crevasse channel. The study area contains abandoned distributaries of various ages which originated from crevasse channels. Abandonment of a distributary channel or distributary network occurs either as a major course shift upstream or by flood flow crevassing a short distance upstream of the abandoned channel segment. Abandonment usually occurs because of

an improved gradient advantage by the new course to the base level.

Distributary channel abandonment closely parallels the abandonment of a course. During distributary channel abandonment, the base of the channel is filled with poorly sorted sands, silts, and organic debris. As the channel continues to fill, the flow velocities are decreased, and the channel is filled by clay, organic ooze, and peats. Abandoned distributaries in the study area are approximately their original width, but only a fraction of their original depth due to infilling. Abandoned distributary channels in the study include Bayou Verret, Bayou Segnette, and several unnamed channels in between.

Abandoned distributaries in the northern portion of the study area have been destroyed by the activities of historic man and/or buried by later Mississippi River natural levee and crevasse deposits.

Abandoned distributaries are recognized on aerial photographs by their associated natural levees and recognized in the subsurface by soil types and sedimentary structures characteristic of channel fill deposits. Distorted bedding, slump structures, organic layers, and minor shell material are also common in channel fill deposits.

Point Bar

Point Bar deposits are primarily lateral accretion deposits formed as a river migrates across its floodplain. River channels migrate by eroding the outside or concave bank and depositing material on the inside or convex bank. With time the convex bank grows in size and the point bar is developed. Point bar deposits are as thick as the total depth of the channel that formed them and fine upward in texture from the maximum size of the bedload material (fine gravel and coarse sand) to very fine-grained soils (clay) at the surface. The basal or coarse grained portion of the point bar sequence (i.e., substratum) is deposited by lateral accretion (channel migration) while the fine-grained or upper portion of the point bar sequence (i.e., topstratum) is deposited by vertical (overbank) accretion.

Point bar deposits in the study area are found only along the present Mississippi River course. These deposits obtain a maximum width of approximately 1 mile in the study area.

Swamp

Swamps occupy poorly drained areas bordering natural levee ridges. These areas receive fresh water and sediment from overflow during seasonal flooding. Fine-grained sediments settle out of suspension and are deposited in the swamps during flooding, forming the thick clay sequences that are characteristic of swamp deposits.

Swamp is concentrated in the central and southern portions of the study area. Further south, salt water intrusion and lower surface elevation due to subsidence has destroyed most inland swamps. The swamp surface is approximately 1 to 3 ft (0.3 to 0.9 m) higher than the surrounding marsh. The general elevation of the most seaward swamps approximate that of the marsh.

Swamp is identified on aerial photographs by a change in color tone, reflecting an elevation change from well drained to poorly drained areas and the corresponding change in vegetation

types. In the subsurface, the occurrence of stiff, massive clays containing some wood and pyritized roots permits the identification of swamp. Swamp deposits usually consist of less than 30 percent organic material, usually in the form of organic clay; however, peat and layers of decayed wood are not uncommon. Organic content is a reflection of the proximity of the stream that supplied the clays during overbank flow. Organic content can be expected to increase with distance from the stream.

Fresh Water Marsh

The southern portion of the study area contains fresh water marsh, a nearly flat expanse where the only vegetation is grasses and sedges. Organic sedimentation plays an important role in the formation of marsh deposits. Peats, organic oozes (mucks), and humus are formed as the marsh plants die and are buried. Decay is largely due to anaerobic bacteria in stagnant water. Vegetative growth and sedimentation maintains the surface elevation at a fairly constant level, and the marsh deposits thicken as a result of subsidence over time. When marsh growth fails to keep pace with subsidence, the marsh surface is eventually inundated by water.

Peats are the most common form of marsh strata remains, and they consist of black fibrous masses of decomposed plants. Detrital organic particles carried in by marsh drainage and vegetative tissues make up the so-called mucks. Mucks are watery oozes that can support little or no weight. Sedimentation occurs in the marsh when floodwater overtops the natural levees, depositing clays and silts onto the marsh surface. Sediments are also transported to the marsh during lunar tides, wind tides, and hurricane tides when sediment laden marine waters inundate the marsh surface.

In the study area, fresh marsh is predominantly of the floating marsh or flotant variety. It consists of a vegetative mat underlain by a finely divided muck or organic ooze grading to clay with depth.

Subsurface Environments of Deposition

Interdistributary Deposits

Interdistributary deposits are sediments deposited in low areas between active distributary channels, usually under brackish water conditions. Sediment charged water during floods overtops the natural levees of distributary channels, depositing the coarsest sediment (silt) near the channel, onto the natural levee. The finer sediment (silty clay and clay) is transported away from the distributary channel and settles out of suspension as interdistributary deposits. In this manner, considerable thicknesses of clay are deposited as the distributary builds seaward. Interdistributary clays often grade downward into prodelta clays and upward into the highly organic clays of swamp and marsh deposits.

Interdistributary deposits are found throughout the study area in the subsurface. These deposits are approximately 35 feet thick and occur at approximately -15 feet below NGVD. Interdistributary deposits consist of saturated gray clays which are highly bioturbated and contain some silt laminae. Shell fragments and minor amounts of organic debris are also commonly

distributed throughout the interdistributary sequence.

Prodelta Deposits

Prodelta deposits are the first of the terrigenous sediments introduced into a depositional area by an advancing delta. Prodelta deposits are some of the most homogeneous and widespread of the deltaic-fluvial environments of deposition. A wave of this type of sedimentation preceded the seaward advance of each of the delta complexes that make up the Mississippi River Deltaic Plain. Prodelta clays are deposited over a long period of time allowing for a considerable amount of compaction.

Prodelta deposits are found throughout the study area and lie directly on Pleistocene deposits. They consist predominantly of medium to stiff, highly plastic clays with relatively high compressive strengths. Small amounts of silt laminae and shell fragments may also be present. In profile, this depositional sequence shows a gradation upward in the prodelta clay sequence from the finest clay to silty, and rarely, sandy clays. Prodelta deposits are approximately 15 feet thick in the study area.

Figure 2 shows the location of the cross-section presented in Figure 3 which depicts the relationships and thicknesses of the depositional environments in the study area.

Regional Geomorphic Development

The study area occupies a small portion of the central region of Louisiana's deltaic plain. Progradation of the present and former Mississippi River courses and deltas is responsible for creating the recent deltaic plain of southeastern Louisiana. Each time the Mississippi River has built a major delta lobe seaward, it has subsequently been abandoned in favor of a shorter, more direct route to the sea. These shifts in centers of deposition have resulted in the distribution of deltaic sediments along the coast of southeast Louisiana. Soon after a delta lobe is abandoned, marine transgression caused by compaction and subsidence of deltaic sediments begins. Nevertheless, the net result between the advancing deltas and the encroaching sea has generally been an overall increase in the size of the coastal plain (Kolb and Van Lopik, 1958). However, within the last few decades, coastal land loss has occurred as man's use of the marsh has opened it to processes of chemical and physical erosion in addition to man's activity in restricting the sediment supply to these areas.

The geologic history of the deltaic plain has been determined from more than 30,000 borings and hundreds of radiocarbon age determinations. Information gained from these data indicates that over the past several thousand years there have been marked changes in Louisiana's coastline. The evolution of the study area is closely related to shifting Mississippi River courses and its distributaries. The Mississippi River has changed its course several times during the last 7,000 years, forming a complex setting in which to observe the various aspects of fluvial and coastal sedimentation.

Important contributions to the understanding of the history of the deltaic plain have been made by Fisk (1944, 1952, 1955), Fisk and McFarlan (1955), Frazier (1967), Kolb (1962), Kolb and Van Lopik (1958), and McFarlan (1961). During the last glacial advance, the Late

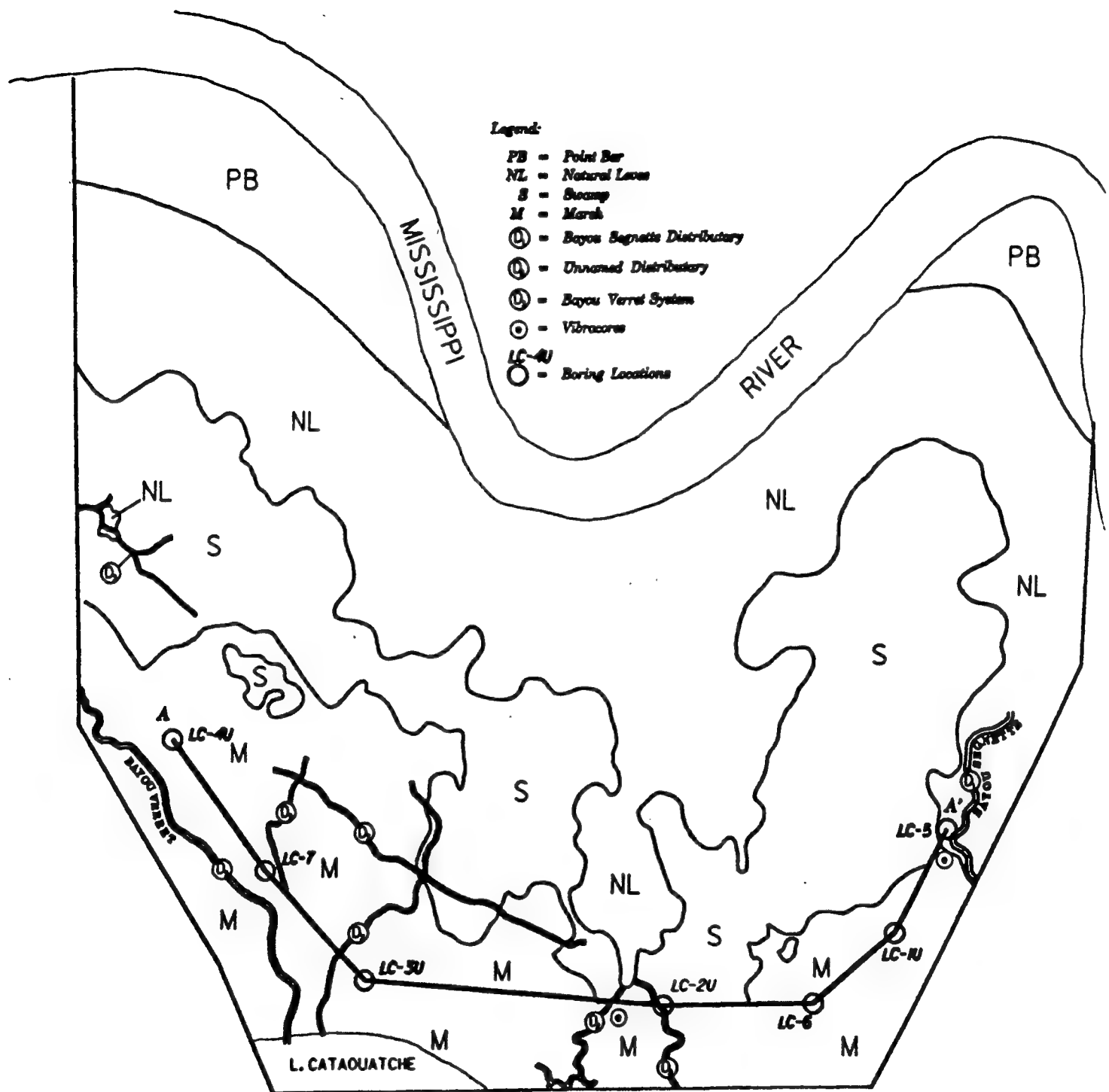


Figure 2. Location of cross-section in study area.

Wisconsinan Stage, continental ice accumulation caused sea level to be lowered about 295 ft (90 m) below its present level (Dillon and Oldale, 1978). As a result, the Louisiana shoreline was as far as 100 miles south of its present position (Kolb and Van Lopik, 1958). Lowered sea level led to the entrenchment of gulfward-flowing streams and their tributaries into the newly exposed deposits of the Pleistocene Prairie Formation, deposited during and subsequent to the Sangamon Interglacial period. Entrenchment of the ancestral Mississippi River into the Prairie Formation formed an alluvial valley with branching tributary valleys approximately 10 to 25 miles wide which trended southeast across the coastal plain approximately 15 miles west of Houma, Louisiana (Kolb and Van Lopik, 1958). The present study area is located near the eastern valley margin of the ancestral alluvial valley.

Between 17,000 and 20,000 years before present (YBP), sea level began to rise as a result of glacial melting (Kolb and Van Lopik, 1958, and Nummedal, 1983). Streams alluviated the entrenched valley with coarse sediments in order to adjust to the rise in base level. Due to rising sea level, deposition of coarse sediments occurred farther up the alluvial valley. Closer to the Gulf, shallow marine sediments were deposited over coarse basal fluvial sediments as the shoreline transgressed northward. As sea level continued to rise, both the quantity and grain size of detritus supplied to the streams decreased, leaving only fine sands, silts, and clays for deltaic deposition (Kolb and Van Lopik, 1958).

Sea level reached its present level approximately 4,000 to 7,000 years ago (Nummedal, 1983). The Mississippi River began building a series of lobate deltas in a gulfward direction as a result of a relatively stationary sea level, displacing the Gulf waters that had extended up the Mississippi River alluvial valley to the latitude of Baton Rouge, Louisiana (Kolb and Van Lopik, 1958). The Mississippi River and its associated deltas shifted several times during this gulfward growth of land.

The history of the study area is dominated by deltaic growth. The Mississippi River deltaic plain is composed of an active and several inactive deltaic complexes extending some 180 miles across southeast Louisiana. Several major deltaic complexes have formed during the last 7,000 years and have been identified in coastal Louisiana. Each delta complex is made up of several delta lobes (Frazier, 1967). These complexes reflect changes in the course of the Mississippi River. From oldest to youngest, the deltaic complexes are the Maringouin, Teche, St. Bernard, Lafourche, and the Plaquemine-Modern delta. The relative ages of these complexes are well established, but the absolute ages are less accurate. Ages were derived from radiocarbon dates on delta plain peats.

Geomorphic Development of the Study Area

The study area has been receiving deltaic sedimentation for the past 4,700 years. During this time three separate episodes of distributary channel development have affected the study area. Contributing to the development of the study area were three deltaic lobes of the St. Bernard delta complex and one lobe of the Plaquemine-Modern complex (Frazier, 1967).

Approximately 4,700 years BP the flow of the Mississippi River was split between Bayou Lafourche (located west of the study area) and the present Mississippi River course in the northern portion of the study area (Frazier, 1967). Frazier (1967) indicates that the present

Mississippi River course received almost full flow at this time. The focus of deposition from this Mississippi River course (Frazier's lobe 3 of the St. Bernard delta complex) was in an easterly direction (Figure 4). The study area was located to the south of the main channel and received mainly prodelta sediments (clay) which began to fill the open water setting present at that time. Flow continued in this Mississippi River course and continued development of a delta front in an easterly direction. The exact position of the Mississippi River course as it flowed eastward through the study area is not known. However, point bar deposits mapped during the study indicate the extent of Mississippi River migration since this time (See Figure 2).

Approximately 4,000 years BP, the Bayou Terre Aux Boeufs delta lobe (Frazier's lobe 5 of the St. Bernard delta complex) began to prograde well east of the study area (Figure 4). During this period, the study area continued to receive deltaic sediments. As delta front deposition moved eastward away from the study area, prodelta deposition waned, and interdistributary sediments began to be deposited by overbank sedimentation from the newly established Mississippi River course. The sequence of interdistributary sediments being deposited directly over prodelta material is presented in Figure 3. Eventually, the interdistributary sediments filled the study area to sea level and a swamp was established on top of these interdistributary deposits (see Figure 3).

Approximately 3,500 years BP, a major distributary system began to develop west of the study area by crevassing of the Mississippi River course. This distributary system is the Bayou Cypriere Longue distributary system, named after a major distributary related to this system. It originated as a crevasse on the cutbank (right bank) of the Mississippi River. The crevasse channel associated with this event remained open long enough (700-800 years) to establish a dense network of distributary channels radiating out in a south and southeasterly direction (Britsch and Dunbar, 1990).

Also at this time, the Bayou Des Familles delta lobe prograded east of the study area. This is Frazier's lobe 7 of the St. Bernard delta complex which he identifies as active from 3,500 to 2,500 years BP (Figure 5). The study area lies between these two major systems. It is into the relatively low area between these two systems that distributaries prograded into the study area.

The first episode of distributary development which affected the study area entered from outside the extreme eastern boundary of the study area. A single, major distributary named Bayou Segnette, which likely originated as a crevasse on the Mississippi River northeast of the study area, nearly parallels the eastern boundary of the study area. This distributary is designated as D1 in Figure 6. Deltaic deposition in the form of interdistributary, swamp and natural levee deposits entered the study area via Bayou Segnette. Radiocarbon dating of a buried peat situated just above the natural levee deposits of Bayou Segnette at approximately -9.0 feet NGVD show that this distributary was active prior to 3140 years BP (see Figure 6 for vibracore sample location). The natural levee deposits were too thick to penetrate with a vibracore, therefore only a minimum date could be obtained. Most of the near surface in the study area was filled with interdistributary and swamp deposits originating from Bayou Segnette.

The second episode of distributary development likely originated as a crevasse on the Mississippi River in the central portion of the study area. The origin of this crevasse has been buried by natural-levee deposits of the Mississippi River but two minor distributaries resulting from this crevasse are located in the extreme south-central portion of the study area. These

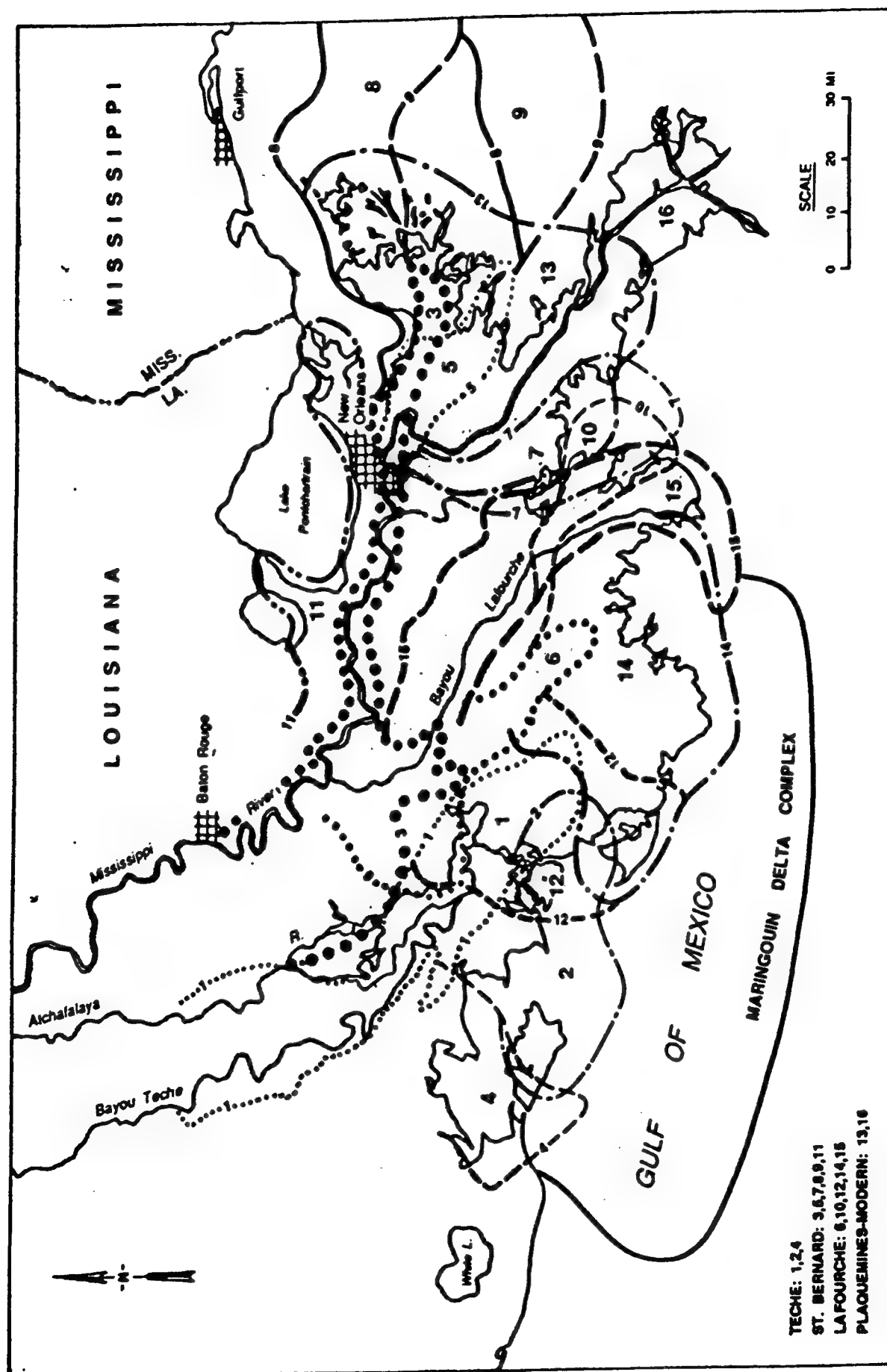


Figure 4. Delta lobes formed by the Mississippi River in the past 1,000 years (from Frazier, 1967)

THOUSANDS OF YEARS BEFORE PRESENT

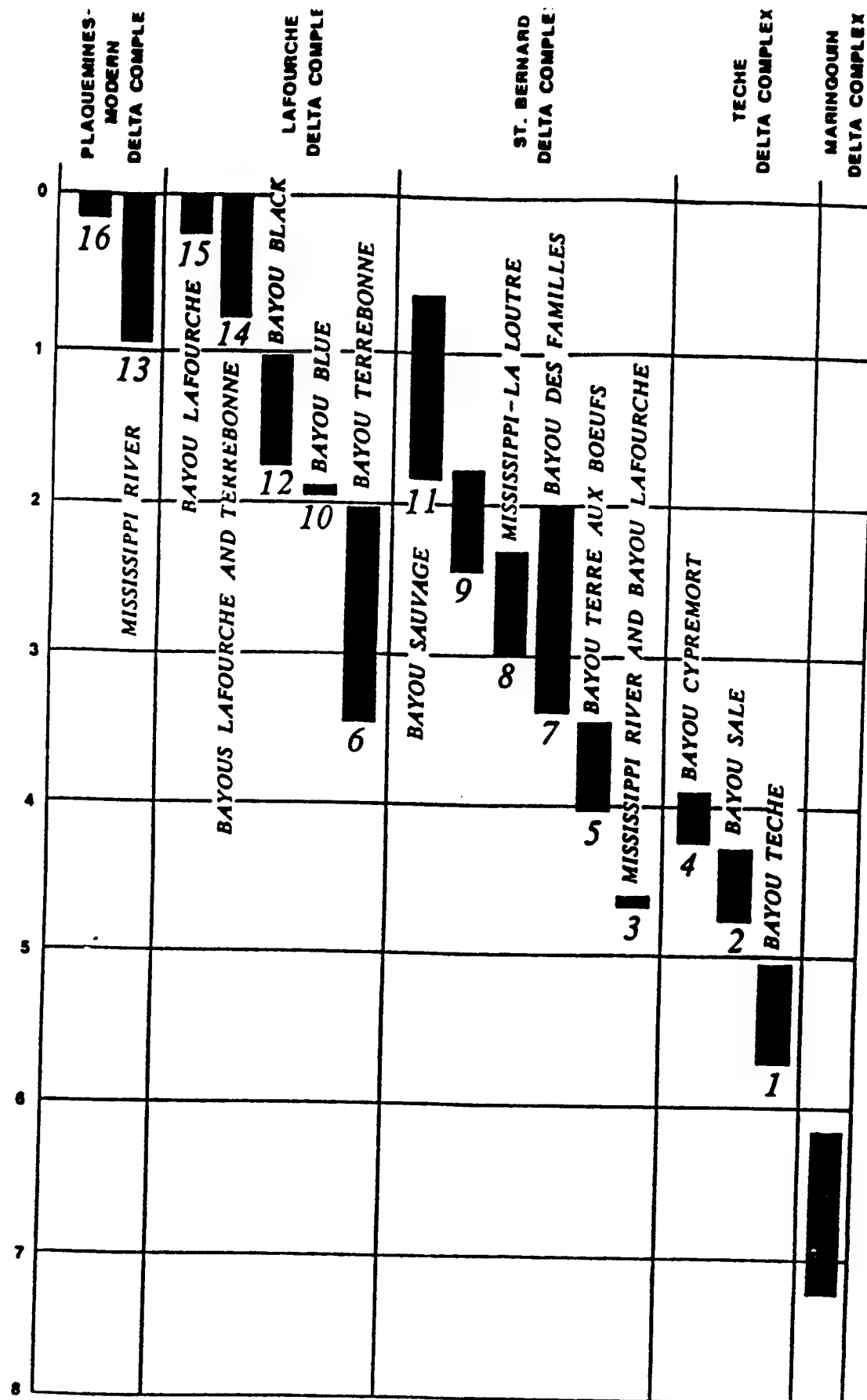


Figure 5. Delta chronology (from Frazier, 1967), see Figure for locations of numbered lobes

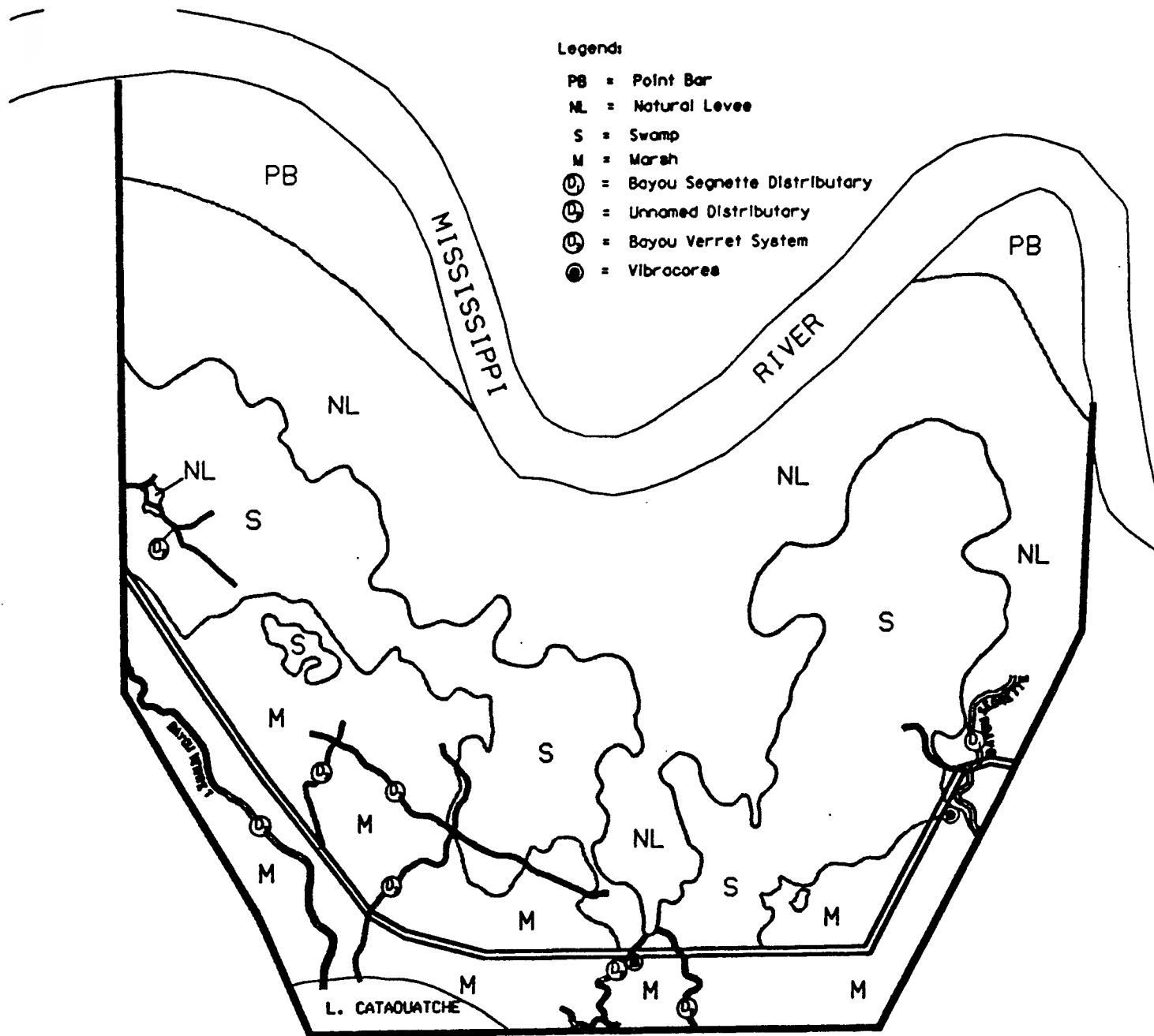


Figure 6. Geomorphic map of study area.

distributaries are designated as D2 on Figure 6. Radiocarbon dating of a peat sample from beneath the natural levee of the westernmost distributary at approximately -9.0 feet NGVD yielded a date of 2950 years BP (see Figure 6 for sample location). More recent natural levee and swamp deposits have buried any remnants of these distributaries in the central portion of the study area.

The third and final episode of distributary development in the study area is related to the Bayou Verret Distributary System. The Bayou Verret System originated as a crevasse on the Mississippi River near Davis Pond, west of the study area. Distributaries of this system were actively prograding into the study area approximately 2,500 years BP as documented from radiocarbon dating in a previous investigation (Britsch and Dunbar, 1990). Bayous Verret and Gaudin are distributaries related to this system. Distributaries related to this system are denoted as D3 in Figure 6. These distributaries prograded into a swamp and shallow lake environment.

No distributary development appears to have occurred since the Bayou Verret System. However the entire study area likely continued to receive intermittent sedimentation due to crevassing on the main Mississippi River course. These events added sediments to the natural levee and swamp deposits through overbank deposition, but no new distributaries developed.

Approximately 1,000 years BP, the Mississippi River course began to build the Plaquemine-Modern delta lobe (see Figure 4, Frazier's lobe 13) to the southeast of the study area. During this period, the study area probably continued to receive sediments from overbank deposition and crevassing, but no new distributaries developed. These sediments only added to the pre-existing natural levee and swamp deposits. There are two possible explanations for the lack of distributary development after the Bayou Verret System: a) the study area had already been filled with a large volume of sediment which reduced the gradient advantage for distributary development and/or b) the crevasses that did occur were not active long enough for distributary development. Instead, short lived flooding events deposited course-grained sediments (fine sand and silt) immediately adjacent to the Mississippi River in the form of crevasse splays and natural levees. The flood waters carried the fine-grained sediments (clay) into the interdistributary areas. Overbank deposition from the Plaquemine-Modern complex and/or lateral migration of the Mississippi River has buried or removed the headwaters of all the existing distributaries.

It is likely that the study area continued to receive some overbank deposition until the early 1900's when the first extensive levees were constructed along this reach of the Mississippi River. Because of the levees, the study area is presently receiving no influx of sediment from the Mississippi River. Destructive processes related to the delta cycle (subsidence and erosion), coupled with man's activities (dredging, logging, and urban development), have dominated the study area since Mississippi River levee construction. Figure 6 depicts the surface geomorphic environments in the study area at present.

SIGNIFICANCE OF GEOMORPHOLOGY TO CULTURAL RESOURCES

Objectives and Approach

The last objective of this study was to determine the archaeological significance of the geomorphic features, especially in terms of locating previously undiscovered prehistoric sites. Goals of this objective were as follows: a) identify and define the principal archaeological site-landform associations and classify the landforms according to their site potential; b) provide guidance for locating sites that are of specific ages or cultural components; and c) identify areas that have high potential for site destruction or preservation by natural geomorphic processes.

The approach that was used to define the relationships between the archaeological sites and the geomorphic features involved identifying the known archaeological sites, evaluating the geomorphic site data from recorded sites, and identifying the important characteristics that relate the archaeological sites to the geomorphic features.

Distribution of Known Archaeological Sites

Recorded archaeological site data from the project area was provided by the Cultural Resource Section, Planning Division, NOD. There are no recorded prehistoric sites within the project boundary. However, there are several sites located along Bayou Segnette where it enters Lake Salvador, south of the project area and possibly one other site just outside the southwest corner of the project area. The sites near Lake Salvador all have Plaquemine/Mississippian cultural affiliations, and possibly Coles Creek, while the other sites affiliation is unknown.

Prediction of Site Occurrence

In view of the absence of sites in the project area, it is not possible to identify specific geomorphic trends or associations with archaeological sites. However, it is possible to examine the overall distribution of sites within the deltaic plain and relate this distribution to geomorphic criteria that can be used in locating unknown prehistoric sites. McIntire's 1958 study showed that patterns formed by the site distribution and their locations indicate that the sites are not distributed randomly; rather they are preferentially related to the geomorphic features.

Gagliano and others (1979) identify that primary locations for prehistoric sites are related to specific types of landforms. Sites are most frequently located near distributary mouth junctions because the proximity to river transportation provides access into fringing swamp and interdistributary basin environments for fish and wildlife resources.

Saucier (1963) suggests that Indians preferred to live upon distributary channels that had reached maximum development and were partially abandoned. He identifies the lower reaches of partially abandoned distributary channels as desired locations since the flood frequency was less, fresh water was readily available, and these areas were in close proximity to swamps, marshes, and fresh to brackish water lakes. All of the known sites in the vicinity of the study area are examples of sites that are associated with a distributary system that was partially

abandoned before occupation. Geomorphic mapping and radiocarbon dating conducted for this study indicates that distributaries were probably active well before the first occupation.

The distribution of the known archaeological sites indicates that sites are not random. Sites are associated with specific landforms. The potential for undiscovered sites in the project area is limited due to the lack of distributaries. Highest site potential occurs on the natural levees of the abandoned distributary channels. The potential for prehistoric sites is further increased at locations where distributary channels diverge from the trunk channel.

Site Preservation and Buried Sites

Sedimentation and Site Preservation

An understanding of sedimentation rates is important in evaluating locations for buried sites and evaluating site decay. Knowledge about sedimentation rates is also important in understanding the stratigraphic and chronological significance of the archaeological record. Rapid sedimentation will promote the preservation and superposition of artifacts and features that result from serial occupation of sites. In contrast, slow sedimentation rates will promote artifact decay and will result in the accumulation of archaeological debris as mixed assemblages. Therefore, it is important to understand, at least in general terms, the significance of sedimentation rates in the project area.

Sedimentation rates in the project area were interpreted from boring data, geomorphic evidence, and by limited radiocarbon dating. Boring data were used to identify soil types and grain-size characteristics of the soil. Grain-size data are an indicator of the energy of the fluvial-deltaic system and help identify the types of depositional environments that may be present.

Organic content of sediments is useful for estimating past sedimentation rates. The formation of peat represents a balance between marsh growth, sediment supply, and subsidence. Thick peat represents a period of stability and a continuous supply of sediment at a rate comparable to or slightly greater than subsidence. A decline in sedimentation rates below a certain threshold, because of shifting river courses and abandonment of distributary channels, will cause a deterioration of the marsh and the eventual formation of open water conditions because of subsidence and the forces of coastal erosion.

Organic clays represent conditions where the sediment rate is greater than the rate for peat accumulation. Often times peat and organic clay are intermixed and represent seasonal or broad regional changes in the sedimentation rate for a region. As the sediment supply increases, the organic content of the stratigraphy generally decreases. A more rapid sedimentation rate, as compared to those for peat or organic clay, will promote the formation of higher ground and woody vegetation representative of inland swamp. Swamp deposits consist of medium, mottled, and bioturbated clays with occasional intermixed organics.

Swamp deposits in the study area interfinger with the natural levee deposits. The most rapid sedimentation rates occur by overbank deposition near the active channel and form broad natural levees. The organic content of natural levee sediments is at a minimum due to organic decay, atmospheric oxidation, and bioturbation of the soil mass by vegetation and organisms.

The most active and dynamic sedimentation rates occur during times of flood flow from a break or crevasse in the natural levee. Coarse-grained sediments are deposited into low lying

marginal areas and form crevasse splays. These sandy deposits contain very little organic materials. The organic materials that are present are transported and will quickly decay if not buried.

Subsidence rates are an indirect measure of sediment accretion. Land in the study area identifies a sediment supply equal to or greater than the subsidence rate, while open water indicates a sediment supply that is less than the subsidence or erosion rate. The types of depositional environments (i.e., natural levee, swamp, marsh, etc.) present in the study area and their surface elevation are a gross indication of the relative rate of sediment accretion versus subsidence. Where elevations are greatest, the long-term sediment accretion rate has been more than the rate of subsidence.

Subsidence rates were determined at the two vibracore locations by radiocarbon dating of peat samples. Two assumptions are made to determine subsidence rates; the dated peat represents a marsh surface which formed at sea level, and sea level has remained relatively constant since the time interval defined by the radiocarbon dates. Using these assumptions a long-term relative subsidence rate of 0.35 feet/century was determined for the project area.

Sediment accretion in the study area has been greater than subsidence as defined by the presence of land as compared to open water. During the development of the study area, sediment supply far exceeded the subsidence rate. The largest sedimentation rates corresponded to advancing distributary systems. However, since the early 1900's sediment supply by overbank deposition and crevassing has been eliminated by levees constructed along the Mississippi River. Land loss in the study area is not occurring due to the levee system, however relative subsidence is an ongoing process.

Knowledge of sedimentation rates in the study area is important for identifying buried surfaces and evaluating the preservation potential of buried archaeological sites. The potential for buried archaeological sites in the study area is judged excellent when considering the types of landforms that are present and the overall sedimentation-subsidence history of this area. High rates of sedimentation throughout the history of the study area are favorable for the preservation of artifacts.

Potential Locations of Buried Sites

In view of the sedimentation-subsidence history of the project area and the age of landforms the potential for buried sites is judged to be high. Locations for buried archaeological sites are similar to the locations identified for surface sites. Depth of burial for sites is dependent on site location, site type, and the landform age. The greatest potential for burial occurs near the Mississippi River, along the major abandoned distributary channels where sedimentation was most active, and on the flanks of natural levees where subsidence is most active.

The sedimentation history of the area as determined from boring data, geomorphic evidence, and radiocarbon dates indicates a nearly continuous history of sedimentation during the past 4,700 years. Boring data indicates that the subsurface sediments are primarily interdistributary and swamp deposits.

Boring data suggest that a paleo natural levee surface occurs at approximately -2 to -6 feet NGVD adjacent to the abandoned distributaries in the study area. The natural levee deposits associated with these distributaries interfinger and merge with swamp deposits. Later deposition is due to overflow from the Mississippi River, distributary reoccupation and/or crevassing, and

vertical accretion of marsh deposits.

In summary, the potential for buried sites in the study area is considered high due to the age of landforms and the relatively continuous sedimentation history in the study area. But only a few distributaries entered the study area decreasing the amount of habital lands. Several distributaries have prograded and been abandoned during approximately the past 3,500 years. Saucier (1963) has indicated, a favorable location for prehistoric occupation was on the distal reaches of well established and partly abandoned distributary channels. This type of geomorphic setting is not present in the study area but may have existed in the past.

Site Destruction and Land Loss

The construction of artificial levees and canals has changed the flooding frequency and the avenues for flood water movement. Consequently, sediment transport into the study area has been severely restricted because Mississippi River flood waters are contained within the flood control levees. The study area is presently receiving no new influx of sediment. Land loss is not occurring in the study area in part because of the levee on the south side of the project area.

Channel migration may impact or destroy archaeological sites. Point bars are formed as rivers migrate across their flood plain. Since distributary channels are usually short-lived, extensive point bar formation seldom occurs on them. Mature point bar development occurs mainly along established channels. The cut bank (concave side) of river channels are locations for fluvial scouring and correspond to locations where archaeological sites may be in danger of destruction. A large cut bank occurs in the central portion of the study area at the Mississippi River. In the study area point bar deposits are developed along the right (west) bank of the Mississippi River. These are also areas where sites may be impacted or destroyed.

Distribution of Cultural Components

It is not possible to identify specific trends from cultural components in the study area as there are no recorded prehistoric sites. However, it is possible to suggest a cultural chronology based on an understanding of the geomorphic development of the study area. The major geomorphic events in the study area can be compared to the cultural sequence recognized for the deltaic plain.

The earliest cultural component that is judged possible in the project area is Poverty Point. The advance of all distributaries in the study area corresponds to the Poverty Point period. No significant distributaries were developed following abandonment of the Bayou Verret system about 2,500 BP.

Periodic wide spread flooding and reoccupation of previous distributary systems may have provided habitable areas for later cultures. Partially abandoned distributary systems adjacent to lakes appear to have been a preferred location for habitation in the vicinity of the project area.

The cultures that are possibly associated with these earlier distributaries are likely to be buried as the natural levees were the favored locations for habitation. Boring data obtained during this study indicates that the natural levees from these earlier distributaries are buried beneath later natural levee, swamp, or marsh deposits. Prehistoric Indian sites that are likely to be encountered at the surface are judged to be relatively late.

CONCLUSION

The following conclusions are drawn from the work performed during this investigation:

- a) Geomorphic mapping of the study area delineated five Holocene geomorphic environments at the surface and four environments in the subsurface. The surface environments comprise a landscape of abandoned distributaries, point bar, natural levees, fresh marsh, and swamp deposits. Subsurface environments consist of swamp, natural levee, interdistributary, and prodelta deposits.
- b) At least three episodes of distributary development have occurred in the study area during approximately the last 3,500 years. These include the Bayou Segnette distributary (greater than 3,140 years BP), the unnamed distributaries (3,000 years BP), and the Bayou Verret distributary system (2,500 years BP).
- c) Geomorphic development of the study area is directly associated with crevassing on the Mississippi River. The distributaries mapped in the study area originated as crevasses on the Mississippi River. These crevasses were likely reoccupied after initial development.
- d) Crevasses probably continued to enter the study area until the early 1900's when the Mississippi River was completely leveed.
- e) Sedimentation in the study area has exceeded subsidence. Subsidence in the study area is estimated at 0.35 feet per century as determined from radiocarbon dating of buried peat deposits. Sedimentation coupled with subsidence in the study area has been favorable for the burial of archaeological sites and for site preservation.
- f) The potential for archaeological sites at the surface and in the subsurface in the study area is considered moderate. Existing site data indicate that preferred locations for surface and subsurface prehistoric sites are the natural levees of abandoned distributaries adjacent to lakes. This setting is not found in the study area. However, this setting does exist immediately south of the study area.
- g) The oldest cultural components that may be encountered in the study area date from the Poverty Point Period. Poverty Point sites may be associated with Bayou Segnette and the unnamed distributaries in the study area. Judging from the sedimentation and subsidence history of the study area, it is unlikely that Poverty Point or more recent prehistoric sites (artifacts) will be found at the surface unless the site has been previously disturbed.
- h) Construction of flood control levees along the main channel of the Mississippi River has prevented Mississippi River sediment from being deposited in the study area since the early 1900's. Land loss is not occurring in the study area due to the south protection levee.

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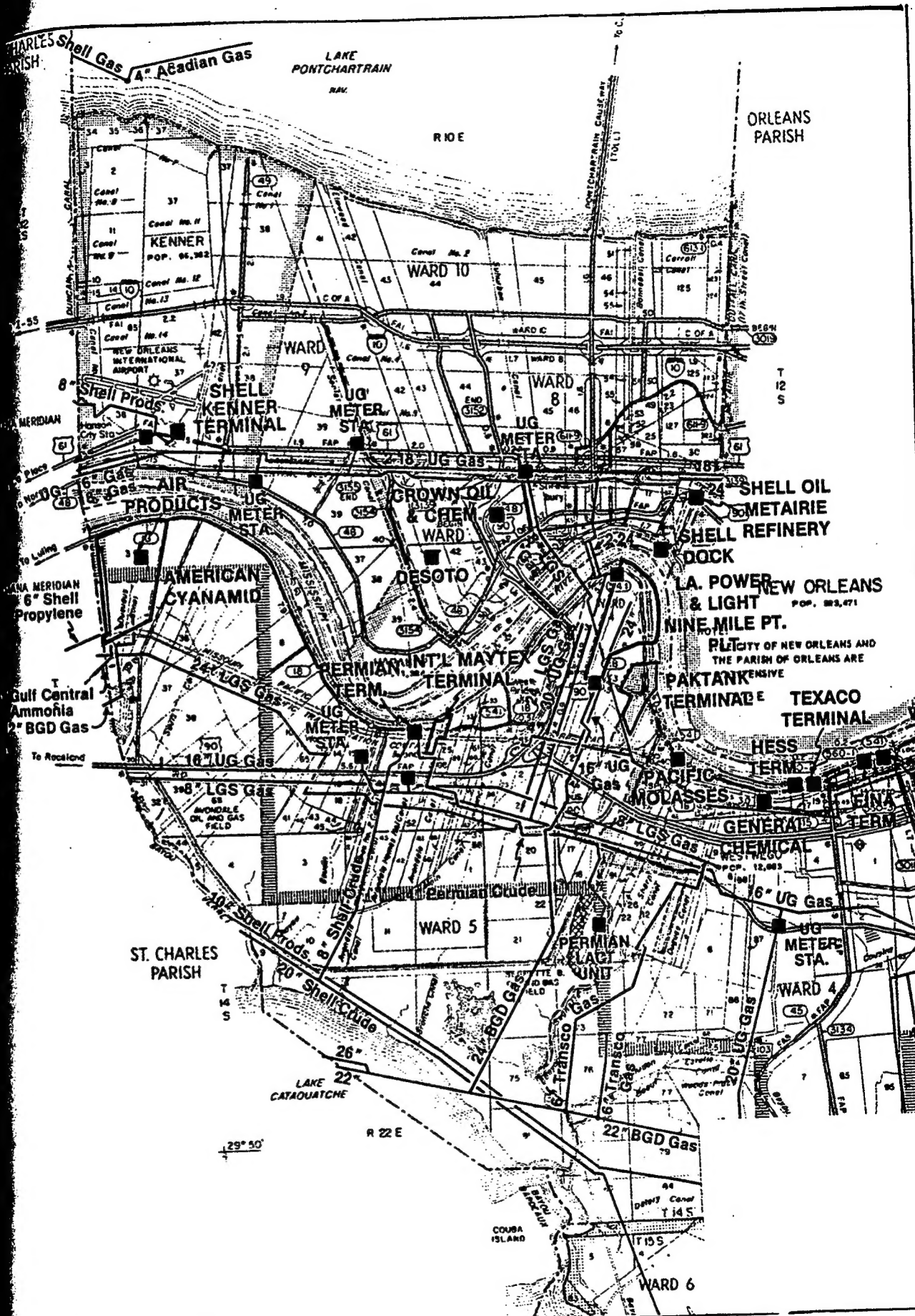
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see
Fig 10

DISTANCE IN
160+00 170+00 180+00 190+00 200+00 210+00 220+00

BOR. LC-4U
STA. 178+50
ON C/L
22 APR 93
GROUND EL. 8.6

Bor. LCL-7
sta. 208+50

AL

SWAMP

INTERDISTRIBUTARY

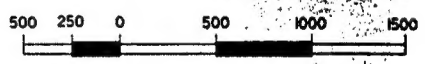
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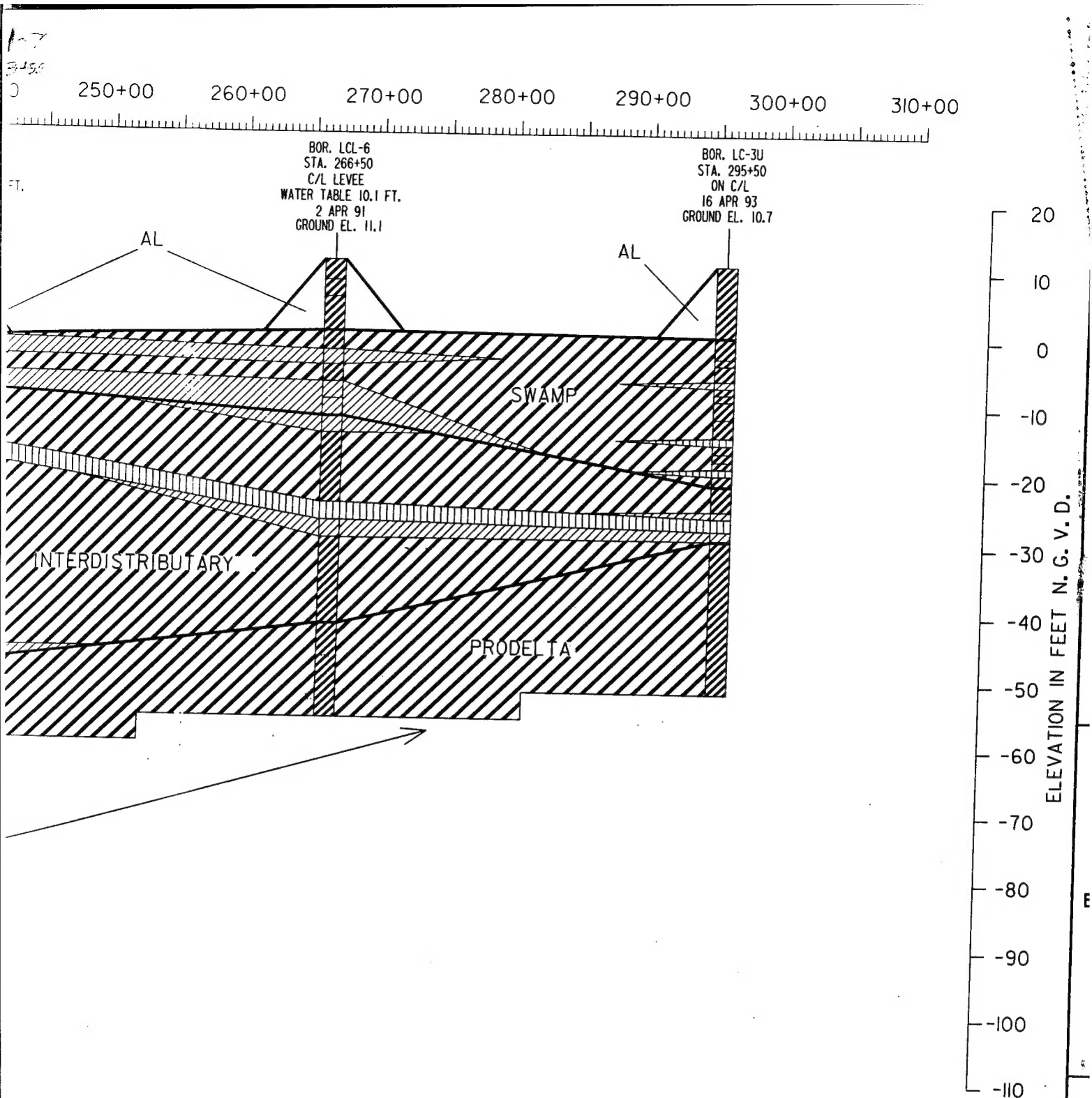
END
FAT CLAY
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MAXIMUM BORING PENETRATION


HORIZONTAL SCALE IN FEET



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SILT
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LAYERS OF FAT AND LEAN CLAYS, SILTS,
, AND SANDS
OGENEUS FAT CLAY WITH SOME LEAN CLAYS
CLAYS, FAT CLAYS, WOOD, AND PEATS WITH
AND SILT LAYERS

WESTWEGO TO HARVEY CANAL HURRICANE PROTECTION PROJECT POST AUTHORIZATION CHANGE STUDY LAKE CATAOUATCHE JEFFERSON PARISH, LOUISIANA			
SOIL AND GEOLOGIC PROFILE			
 U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS NEW ORLEANS, LOUISIANA			
DESIGNED BY: D. DILLON	PLOT SCALE: 10	PLOT DATE:	CADD FILE: LAKECAT1
DRAWN BY: D. DILLON	CHECKED BY: D. BRITSCH	DATE: AUG. 1995	FILE NO.